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ORIGINAL MEMOIRS.

INVAGINATION OF MECKEL'S DIVERTICULUM.

REPORT OF A CASE AND A STUDY OF THE LITERATURE.

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A PERSISTENT Meckel's diverticulum in the human body is at all times a serious menace to life. It has been roughly estimated that this anomaly is present in 2 per cent. of bodies (this figure is probably too low), and it is likely that few persistent diverticula exist without giving rise to some marked symptoms.

The mortality from intestinal obstruction and peritonitis due to this abnormality is so high that it would not only be justifiable, but necessary, to remove this structure by operation, could a diagnosis of its existence be arrived at before serious symptoms necessitate an urgent operation under usually unfavorable conditions.

The foregoing opinion has led me, during the past few years, to make a special study of this variety of intestinal obstruction; and, since the subject is too large to be dealt with in a single paper, I propose to consider "*Invagination of Meckel's Diverticulum*" and its complications. A case of this nature has recently come under my observation, and presents many points of interest: the child was under the care of Mr. Arbuthnot Lane, to whom I am indebted for his courtesy in permitting me to publish the case.

The details are as follows: Alfred B., male, aet. 8 years. Admitted into the Hospital for Sick Children, Great Ormond Street, February 5, 1908.

Past History.—The mother states that as a baby he passed blood in the motions once, after a dose of salts. At 5 years, he had a definite attack of violent abdominal pain accompanied by vomiting and the passage of blood "per rectum." This attack lasted one day, after which the symptoms passed off. The mother had further noticed that frequently, on going to stool, the child "stamped and went white as if in pain," but made no complaint.

History of Present Illness.—The onset of the present attack, on Thursday, January 30, was characterized by severe pain in the "lower half of the stomach" (the child pointed across the umbilicus when questioned). The pain continued on the 30th and 31st of January, though the child attended school.

On February 1, the bowels acted as a result of some licorice powder, the pain diminished, and he felt better. Patient felt better till the afternoon of February 2, when, while at Sunday school, he was attacked with violent abdominal pain. The bowels acted. February 3, pain was more acute; retching supervened and from this time onwards there was absolute constipation. February 4, child quieter, but refused food; vomited three times. February 5, vomited three times. The mother thinks there was some blood in the vomit. *No blood was at any time passed per rectum.*

State on Admission.—Temperature, 101° F.; pulse, 100. Patient looked ill. Facies of the abdominal type.

Abdomen.—Considerable distention, especially above the umbilicus. The contour of the abdomen conformed to the type of a small intestine obstruction and distended coils of gut were clearly outlined. Movement was free everywhere, while there was no tenderness or rigidity. No tumor was felt.

When in bed the child slept for about an hour and seemed comfortable. Examination of the rectum, which was filled with scybala, was negative. The *umbilicus* was raised and dome shaped, and the skin was of a bluish tint and scarred to a marked degree; the abnormality was sufficient to attract attention at once. A high enema yielded no result. The tongue was brown but moist: in fact the general condition, in spite of a history of seven days, was comparatively good. The bladder was distended and a con-

siderable quantity of urine was drawn off by a catheter before operation.

In view of the fairly characteristic past and present history and the condition of the umbilicus, intestinal obstruction, due to a persistent Meckel's diverticulum was suspected; the real nature of the case was made clearer by the palpation of a sausage-shaped tumor lying beneath the liver, before opening the abdomen, when the patient was under the influence of chloroform.

Operation.—The abdomen was opened by a 4-inch incision by splitting the fibres of the right rectus. A good deal of straw-colored fluid escaped on opening the peritoneum, and the intussusception was immediately found with two fingers in the abdomen. Reduction was effected by manipulation till the cæcum was free of contents, when it was found that an irreducible enteric intussusception remained, which had caused the ileoæcal one, now reduced. The irreducible mass was about 4 inches long and extended to 3 inches above the ileoæcal valve; while through the intestinal wall, below the presenting part, could be seen and felt a polypoid mass projecting into the lumen of the termination of the ileum.

The intussusception, with two inches of healthy gut above and below was excised, thus leaving 1 inch of healthy ileum adjoining the cæcum. During the operation saline infusion had been administered, and, since the child's condition was fairly good, an immediate axial anastomosis was decided on. This procedure was accomplished in the usual way, and the abdomen sewn up in layers; the operation lasting a little over $1\frac{1}{4}$ hours. The patient stood the operation well and gave no cause for immediate anxiety till about 6 hours later, when froth tinged with faeces persisted in coming from the nostrils, a condition which continued until death 15 hours after operation (a motion containing blood and mucus had been passed shortly after the child was returned to bed).

At the autopsy, the anastomosis proved in every way satisfactory and there was no sign of infection of the peritoneum.

Examination of the Specimen (see Fig. 1).—On opening up the specimen it was seen that the intussusception had been started by an invaginated Meckel's diverticulum about $2\frac{1}{2}$ inches in length. All the coats were completely invaginated and, with the intestinal wall involved, quite gangrenous. Just below the origin

Number.	Author.	Sex.	Age.	Previous abdominal crises.	Duration of final attack.	Remissions in major attack.	Onset during rest or active movement.	Passage of blood per rectum.	Passage of faces or flatus.
1.	Gray.....	M.	8 years	2 Definite, probably more.	7 days	One	Active movement	None	Two stools
2.	Watson-Cheyne...	M.	19 years	Many	7 days	Two	Rest	None	One stool
3.	Von Mandach.....	M.	2½ years	None	7 days	None	.....	None	Diarrhoea
4.	Bidwell.....	M.	3½ years	Many	8 days	Oper.	Active movement	None	None
5.	Robinson.....	M.	5 years	Many indefinite	2 days	One	.....	None (enema tinged)	One stool
6.	Weill & Frankel...	F.	4½ years	None	1 day	None	.....	Melena	None
7.	Holbeck, ²⁹	M.	18 years	None	3 days	None	.....	None	None
8.	De Quervain.....	M.	16 years	.....	2 days	None	.....	None	Many stools
9.	Von Strubenrauch, ³⁰	F.	5½ years	.....	5 days	.....	.....	Yes	Many stools
10.	Brunner.....	M.	4 years	None	3 days	None	.....	Yes	None
11.	Terry.....	M.	12 years	.....	½ a day	None	Activity	Yes	One stool
12.	Travers, ³¹	M.	10 years	.....	1 day	None	.....	None	None
13.	Morrison, ³²	M.	5 years	.....	1 day	None	.....	Yes	.....
14.	Wainwright.....	M.	17 years	None	1½ days	Gradual onset	Activity	None (enema tinged)	None
15.	Adams.....	M.	42 years	One	More than 7 days	.....	.....	None	.....
16.	Zum Busch.....	M.	21 years	Many	2½ days	None	Activity	Yes	? several motions
17.	Coffey.....	M.	7 years	Numerous	4 days	One	.....	None	Two motions, flatus also
18.	O'Connor.....	M.	13 years	None	None	None
19.	Pitts, ³³	F.	8 years	5 days	None	4 motions
20.	Eve, ³⁴	M.	13 years	28 days

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Situation of pain.	Tenderness.	Meteorism.	Abnormality of umbilical cicatrix.	Palpable tumor.	General condition compared with duration of final attack.	Operation.	Result.	Appearance of Diverticulum, etc.
Umbilical region	None	Gen'l.	Marked	Only under anaesthetic	Good	Yes (Res.)	Death	Gangrenous, slightly club-shaped, all coats of Diverticulum invaginated.
Epigastrium	1½" below umbilicus	Varying	.....	Yes	Good	Yes (Res.)	Recovery	Small degree of stenosis of gut.
	.....	Gen'l.	.....	.....	Good	Yes (M. Red.) Yes (Res.)	Recovery Recovery	Much inflammatory thickening. Only mucosa invaginated. Inflammatory stenosis of gut.
Umbilicus	None	Gen'l.	.....	Yes	Bad	Yes (M. Res.)	Death	.....
	.....	.....	.....	.....	.....	Yes (Res.)	Death	.....
	None	Gen'l.	.....	Only under anaesthetic	.....	Yes (M. Res.)	Death	.....
	.....	Gen'l.	.....	None	.....	Yes (Res.)	Death	Diverticulum gangrenous, all coats invaginated.
	.....	.....	.....	Yes	.....	Yes (Res.)	Death	.....
	.....	Gen'l.	.....	Yes	Bad	Yes (Res.)	Recovery	Accessory pancreas on apex of Diverticulum (? a real Meckel's diverticulum.)
Just below and to the right of umbilicus. Right side of abdomen.	.....	.....	.....	.....	Good	Yes (M. Res.)	Recovery	.....
	.....	.....	.....	Yes	.....	Yes (M. Red.)	Recovery	.....
	.....	.....	.....	Yes	.....	Yes (M. Res.)	Recovery	.....
	.....	.....	.....	None	Good	Yes (M. Res.)	Recovery	.....
Lower zone of abdomen.	Situated with the pain	None	.....	None	Good	None	Death	Evidence of previous inflammation of Diverticulum.
Umbilicus.	.....	.....	.....	Yes	? Fair	Yes (Res.)	Recovery	Subserous lipoma at apex of Diverticulum.
	.....	.....	.....	Yes	Good	Yes (Res.)	Recovery	Intussusception and Diverticulum gangrenous.
	.....	.....	.....	None	Good	None	Recovery	Intussusception sloughed out per rectum.
	.....	.....	.....	Yes	Good	Yes (Res.)	Recovery	Gangrenous.
	.....	.....	.....	.....	.....	Yes (Res.)	Death	.....

Number.	Author.	Sex.	Age.	Previous abdominal crises.	Duration of final attack.	Remissions in major attack.	Onset during rest or active movement.	Passage of blood per rectum.	Passage of faeces or flatus.
21.	Erdmann, ³⁵	F.	9 years	.....	2½ days	None	Activity.....	Yes	None
22.	Ingle, ³⁶.....	..	½ years	.....	5 days	None	.....	Yes	None
23.	Cawardine.....	..	1½ years	.....	2 days	.....	.....	.....	.....
24.	Küttner.....	F.	49 years	One marked	3 days	None	.....	None	None
25.	Maroni.....	M.	26 years	.....	.....	.....	.....	.....	.....
26.	Ewald.....	..	.....	Many marked	.....	.....	.....	.....	None
27.	Strauch.....	F.	6 years	Many marked	2 days	None	Rest	None	Numerous motions
28.	Bayer, ³⁷	M.	2½ years	.....	.....	.....	Activity	.....	.....
29.	Rehn.....	M.	30 years	Many	Chronic	Many	No definite onset	None	Many motions
30.	Jäkch.....	F.	30 years	Many	Chronic	Many	No definite onset	None	Many motions
31.	Forgue & Riche...	M.	60 years	.....	.....	Partial obstr.	.....	.....	?
32.	Guyot, ⁴⁰	M.	6 years	.....	5 days	.....	.....	.....	.....

No.	Author.	Further cases of which no clinical details are given.
33.	Heller.....	Worm-like Diverticulum with lumen obliterated in lumen of intestine. Found at autopsy.
34.	Heller.....	Movable cord in lumen of intestine with accessory pancreas at apex. Found at autopsy.
35.	Heller.....	Specimen.
36.	Treves.....	Specimen in Guy's Hospital Museum.
37.	Treves.....	Specimen in Royal College of Surgeons.
38.	Adams, ³⁸	Specimen from a case ending fatally after 14 days acute illness.
39.	Studsgaard, ³⁹	M. aet. 37 years. Resection. Death. Intussusception caused by invagination of Meckel's Diverticulum.
40.	Boldt.....	Child. Invagination of Diverticulum (? Meckel's) started an intussusception.

Situation of pain.	Tenderness.	Meteorism.	Abnormality of umbilical cicatrix.	Palpable tumor.	General condition compared with duration of final attack.	Operation.	Result.	Appearance of Diverticulum, etc.
Right side of abdomen	Gen'l.	.....	Bad	Yes (Res.)	Death	.....
	Gen'l.	.....	None	Bad	None	Death	.....
	Situation not stated	Marked and gen'l.	.....	.....	Yes (M. Red.) Yes (anastomosis only)	Death	Club-shaped. Evidence of previous inflammation. Invagination of Diverticulum only. 3 perforations.
		Gen'l.	.....	.....	Yes (obstruction not removed).	Death	Diverticulum only invaginated. Polypus the size of a cherry attached to base of Diverticulum.
	None	Death	Invaginated Diverticulum only. Also stenosis of gut at its attachment due to inflammation.
	Present situation not stated	Gen'l.	.....	Yes	Good	Yes (Res.)	Death
	Yes	.....	.....	Club-shaped. Evidence of previous inflammation.
Burning pain at umbilicus.	Yes	Good	Yes (M. Red.)	Recovery	.....
			Yes	.....	.....	.....	Club-shaped. Intussusception started above Diverticulum which was probably invaginated independently.
	General	.....	Gen'l.	.....	Yes	Good	Yes (Res.)	Recovery
	Club-shaped; lumen obliterated by inflammation converting Diverticulum into a polypus.
	None	Death	Invagination of Diverticulum only.
	Yes (anastomosis only)	Death	Gangrenous.

N. B.—Res. = resection of intestine.

M. Res. = resection of Meckel's diverticulum.

M. Red. = invagination of Meckel's diverticulum reduced.

of the diverticulum from the opposite mesenteric border, the intestine was considerably stenosed (Fig. 1). The total amount of intestine resected was about 18 inches.

This case is a most instructive one and full of interest; while the points to which I particularly wish to draw attention are drawn up in an appended table. (See Table.) I have been able to collect 39 cases of Invagination of Meckel's Diverticulum which, with my own case, make up a total of 40.

The condition is not common, though, I believe, not as rare as is generally supposed. An invagination of Meckel's diverticulum has usually produced an intussusception of the intestine also; out of the 40 cases I have collected, in 7 only was the diverticulum alone invaginated, while one of these was involved in an intussusception arising above the attachment of the diverticulum to the gut, and was therefore probably of independent origin (Rehn¹).

Forgue and Riche² give these figures as 6 out of 33, while now with the additional cases I have collected, the figures are 6 out of 40. That is to say, invagination of Meckel's diverticulum alone occurs in 15 per cent. of cases and causes intussusception of the intestine in 82 per cent.

The reason, in the first place, for the rarity of this lesion is that, for such an occurrence, the diverticulum must be free, and this is the most uncommon condition met with.³ Usually this structure acquires a secondary attachment to the mesentery or more rarely the intestine, and less commonly still remains fixed to the umbilicus.³ In the second place, once invaginated into the lumen of the intestine, Meckel's diverticulum acts like a polypus in tending to produce an intussusception.

Sex.—This appears to be a matter of some importance, for, out of the 30 cases in which the sex is mentioned, 23 were males and 7 females, giving a figure of 76 per cent. males. Now this marked preponderance of males over females does not agree with anatomical findings, and one can only conclude that this structure, when present, is more likely to give rise

to symptoms in males than females. This, as a fact, is the case; and the reason will be shown later.

Age.—This is a matter of some weight in diagnosis, for the average age at which the final attack has occurred is 15 years. Out of 32 cases where the age is stated, 16 (50 per cent.) were under 10 years, 9 between 10 and 20 years and 8 over 20 years, while it is important to note that only 2 cases occurred under 2 years, the *commonest age* for the occurrence of intussusceptions; this will be again referred to later.

The commonest period of life, then, for this lesion is childhood and early adult life.

History of Previous Abdominal Crises.—I cannot lay stress too insistently on the importance of obtaining a most accurate history of past ailments, however trivial, in any case of acute abdominal disease—out of the 17 cases where the past history is detailed, in 12 (70 per cent.) was a definite account of previous abdominal crises obtained. Recurrent abdominal crises are common, and constitute a most important symptom, in persons harboring a persistent Meckel's diverticulum;⁴ and, in many of the cases appended, the history alone, in my opinion, was sufficiently definite to warrant an exploration before the onset of acute symptoms.

To quote briefly from some of these histories: In my own case, the patient passed blood, even as an infant, had a violent attack of abdominal pain accompanied by vomiting and the passage of blood at 5 years, and appeared to suffer frequently on going to stool. In Watson Cheyne's case⁵ the man complained of abdominal discomfort for two years leading up to an attack of diarrhoea and vomiting 8 months before coming under observation. These crises with flatulence and vomiting increased from fortnightly to weekly intervals, gaining always in intensity.

Bidwell's case⁶ had a severe hemorrhage from the rectum 6 months previously, and upon this supervened weekly attacks of abdominal pain and vomiting *on rising in the morning*, which passed off after an hour or so.

Robinson's case⁷ complained of occasional abdominal

pain, and that reported by Zum Bush⁸ gave a similar though more definite account of recurring crises.

In this connection Coffey's case⁹ is well worthy of note, for this child 5 years previously was attacked with severe abdominal cramps with cold sweats and vomiting, which lasted 36 hours, and was followed by similar attacks every month accompanied by the passage of blood per rectum on each occasion.

Küttner's¹⁰ and Adams's¹⁷ patients had previously suffered from an attack of acute intestinal obstruction, which had subsided spontaneously, while Ewald¹¹ reports a similar attack followed by recurring crises leading to a diagnosis of intestinal stenosis. Strauch,¹² Rehn¹ and Jäkch¹³ all report perfectly definite attacks of violent abdominal colic or cramps, varying in their intensity, their persistency, and in their concomitant symptoms.

The above cases well repay perusal, and I can only repeat that such accounts, especially in the presence of other signs, should warrant a strong suspicion of the presence of a Meckel's diverticulum.

As regards the explanation of these crises, I have elsewhere³ remarked on the liability to twisting and consequently slight attacks of inflammation to which such a structure is liable, especially in view of its poor blood-supply: while the laxity of its mucous membrane,⁵ in a free diverticulum, added to such attacks of inflammation, renders it prone (as I hope to show later) to recurring partial invagination which would well account for the frequent passage of blood in many of the recorded cases.

The Onset, Character, and Duration of the Final Attack.
—When a case is finally under observation for the treatment of acute symptoms, it is often of considerable importance to arrive at an accurate diagnosis, especially as the general condition in many of these patients we are considering is, in my experience, particularly apt to be misleading as regards the severity of the lesion. If column 15 in the table be referred to, it will be seen that I have attempted to arrive at a reasonably

accurate conclusion from the data as to the condition of the patient when compared with the duration of the attack. It seemed to me, on reading the reports, that the condition was good or fair in 14 and bad in 4 out of the 18 cases where I was able to form an opinion. Some stress is laid on this, because in my own case I was nearly misled by the comparatively excellent condition of the boy (he was seen on the seventh day of the attack) who slept comfortably for over an hour on admission, and did not complain of pain; while there was no evidence of peritonitis.

The explanation is that the early symptoms are due to the invagination, or inflammatory attacks preceding the invagination, of the diverticulum itself, while the succeeding intussusception or gangrene of the intestine often does not occur till a day or two later. The duration is in consequence longer and the patient's condition better than might be expected, while the illness tends to start somewhat gradually and increase in intensity to the climax, when the more serious lesions supervene. This is a point of importance in the diagnosis from volvulus, for which the condition has been mistaken (Küttner¹⁰).

It would be expected from the above remarks that remissions, or temporary relief, would be observed during the final attack; this in fact has been remarked in several cases. These remissions are well illustrated in the history of the case here reported, as also in Watson Cheyne's case.⁵ Coffey's case⁹ is no exception, while Rehn's¹ and Jäckh's¹³ cases show how this feature can be so marked that the onset is subacute or chronic in nature: in the former case there were never any acute symptoms, the operation being performed at the most favorable period, *i.e.*, before the onset of any acute symptoms.

Another important point in this connection is the time of onset. In every case where the point is mentioned, except that of Strauch,¹² the acute symptoms started during activity. As a contrast, acute appendicitis, which is closely simulated by this condition, commonly starts while the patient is at rest, and usually in the early morning. Thus my case was at school

at the time, while in Bidwell's⁶ the attacks occurred "on rising in the morning." Terry's case¹⁴ was at school, Wainwright's,¹⁵ out for a walk to get rid, apparently, of the discomfort and fulness, etc., from which he had been suffering from some days previously. Zum Busch's⁸ patient was an acrobat, and the history of this case is particularly interesting. Kelly¹⁶ gives a list of the factors tending to produce torsion of Meckel's diverticulum which, I believe, precedes invagination—amongst these are the perpetual movement of the intestines, and the continual play of the abdominal muscles. This accounts for the frequency with which the minor crises, as well as the final acute illness, take place, when the abdominal muscles are being used; and it also explains to some degree the large preponderance of males over females, whose lives are so much more sedentary. In this connection it is also interesting to note that infants are almost exempt, for only two cases occurred under 2 years, while children under 10 years show the highest percentage, and this age is that of the greatest activity.

Thus in my case, the child appeared to suffer pain on going to stool, while in Brunner's²¹ the onset took place immediately after opening the bowels; this last feature I have noticed in acute lesions of Meckel's diverticulum other than invagination. As regards the duration of the final attack, if the chronic cases be excluded, the average figure was $3\frac{1}{2}$ days, though 12 cases showed a history of over 5 days duration.

Finally in connection with the onset, the character of the pain is always severe, usually violent, and frequently situated in the umbilical region. It has been variously described as colicky, cramp-like, and on one occasion it was preceded by burning pain at the umbilicus (Rehn¹). Vomiting is a constant symptom.

Passage of Blood per Rectum, etc.—In spite of the frequency with which invagination of Meckel's diverticulum leads to intussusception, it is a curious and noteworthy point that a large number of cases pass no blood during the final attack.

Thus out of 25 cases, in which this sign is referred to, only 7 passed bright blood (28 per cent.), one suffered from abundant melæna (Weill and Fränkel¹⁸) and 17 passed no blood at all (68 per cent.). In two of these 17 cases the enema was tinged with blood only (Robinson⁷ and Wainwright¹⁵). This is a noteworthy diagnostic feature, for the palpation of the characteristic tumor together with this negative sign would seem to warrant a suspicion of the real nature of the lesion. If the table be referred to, it will be noticed that those cases in which blood was passed were mostly those with a short history; it seems probable, therefore, that the invaginated diverticulum becomes gangrenous early (it will be remembered that the blood supply is nearly always derived from that of the adjacent intestine, and is of the poorest) and a certain amount of paralysis of the intestine ensues which prevents the blood from being passed. In support of this, my own case passed blood with a motion after the operation. Another striking feature is that constipation is seldom absolute (11 cases out of 24); 13 cases, or over 54 per cent., passed at least one motion, several passed more than one, while diarrhoea was a feature in Von Mandach's case.¹⁹ This characteristic is in keeping with the nature of the onset and may prove of considerable aid in establishing a diagnosis.

Tenderness as a rule is not present in any degree, unless peritonitis has set in, when it is diffused.

Meteorism is general, when present, and the shape of the abdomen conforms as a rule to the type usually seen in a small intestine obstruction; distended coils of gut are frequently visible. There is, in this class of case, no localized meteorism so characteristic of strangulation by a diverticulum.³

A Palpable Tumor is mentioned 16 times, its detection occurring twice under anaesthetic only; probably distention, which is commonly present, prevented a satisfactory examination in the remaining cases, or the diverticulum only was invaginated.

Abnormality of Umbilical Cicatrix.—I have elsewhere³ drawn attention to the value of this sign in the diagnosis of

the presence of a Meckel's diverticulum, and for details I would refer the reader to that paper. I will only emphasize here that, when present, it has proved of great value in the recognition of the cases which have come under my personal observation, and, in the present report, was of considerable assistance in the formation of a correct diagnosis. I regret that unfortunately no photograph was taken of this child's umbilicus.

As to the frequency with which this sign is present, it is impossible to make a statement, since no mention is made of it by any author except Bidwell,⁶ who only remarks on a previous umbilical hernia, for the cure of which he had operated.

Pathology.—Several views have been advanced to account for the invagination of the Meckel's diverticulum, which must of necessity be lying free in the abdominal cavity. Such free diverticula are particularly liable to undergo torsion about their own longitudinal axis. Any one of these accidents may prove fatal, by causing gangrene of this structure; many such cases have been reported,³ though it is foreign to my purpose to discuss them now. Repeated slight torsions would have the effect of causing some degree of obstruction at the attached end, with consequent oedema and swelling of the free end, and also with the outpouring of mucus into the lumen of the diverticulum. Evidence of this is seen in examining specimens in which the diverticulum is usually club-shaped, its bulk narrowing to a neck at the point where it is attached to the intestinal wall. Evidence of inflammatory thickening at this spot, even extending to, and causing stenosis of, the neighboring intestine, is mentioned by several authors in their reports. Thus Watson Cheyne,⁵ Adams,¹⁷ Küttner,¹⁰ Ewald,¹¹ Strauch,¹² Jäckh¹³ and Heller,²⁰ all describe such pathological evidence, while to this may be added my own case.

The following explanations of the process of invagination have been given:

Küttner¹⁰ says that invagination is set up by the pres-

ence of an accessory pancreas, a polypus, or a fecal mass in the diverticulum.

An accessory pancreas situated at the tip of this structure is mentioned by Brunner²¹ and Heller,²⁰ while in Zum Busch's case⁸ there was a subserous lipoma in the same situation. Such tumors would, in my opinion, tend to prevent, rather than to assist, invagination; and even if they did explain the process in these cases, to the majority, in which no such tumors are found, some other mechanism must be assigned.

A polypus when present would undoubtedly account for invagination. In Maroni's²² case a polypus the size of a cherry was probably responsible, but this tumor, it should be noted, was attached to the base, and *not* the apex of the diverticulum.

The faeces to play any active part must be very problematical, in view of the fluid nature of the contents of the small intestine.

De Quervain's²³ explanation, that a rush of fluid along the intestine produces a negative pressure in, and so invagination of, the diverticulum, we can disregard as being too fantastic.

The most reasonable explanation seems to me that the invagination starts at the base and not at the apex, as has been assumed. Slight torsions, the symptoms of which have been noted in many cases, produce congestion, swelling, and a quantity of mucus in the lumen of the diverticulum. Now it has been noted that the mucosa of this structure is loosely attached to the muscular wall (Watson Cheyne⁵); so loose is it that the mucous coat alone can be invaginated.⁵ The consequent swelling of the mucosa and its separation by serous effusion from the muscular coat (aided perhaps by bacterial infection) produce a closure of the orifice into the intestine, and efforts to expel the accumulated contents succeed only in squeezing the mucous coat into the intestine, which would ultimately drag after it the muscular and serous coats also. The invagination would thus start at the neck or base; and the swelling is progressive, on account of the contraction of the

circular fibres behind, thus tending to prevent a return to the normal condition. Intussusception of the intestine may follow immediately, or the mass may hang free in the intestinal lumen and give rise to recurrent attacks of hemorrhage, etc., symptoms which we have seen are often characteristic of these cases.

Repeated attacks of inflammation or mechanical congestion in such an invaginated diverticulum, if an intussusception is not produced, will cause the fusion of the now adjacent serous surfaces and an intestinal polyp is produced. I think this may be the real origin of some, at any rate, of the so-called high intestinal polyps, which are said to cause hemorrhage from the bowel and sometimes an intussusception. Specimens can be seen illustrating this transformation of an invaginated Meckel's diverticulum into an intestinal polyp, though more observations are of course necessary to establish such a statement (Jäkch,¹⁸ Heller²⁰).

Prognosis.—When acute symptoms have supervened, the prognosis is very grave, while, if operation is practised during the quiescent stage (or when symptoms are only subacute or chronic) the outlook is more hopeful. Thus of the two chronic cases operated on, one recovered and in one the result is not stated (Rehn¹ and Jäkch¹⁸). No details are given of Boldt's case.²⁴ The lesion was discovered at autopsy in two cases (Heller²⁰), death presumably occurring from other causes. Three cases are specimens only (Heller,²⁰ Treves²⁵). Of the 32 cases left, where an adequate clinical account is given, 13 recovered and 19 died, a mortality of nearly 60 per cent. Six cases were not operated on and only one of these, O'Connor's,²⁶ recovered by the sloughing of the whole intussusception, which was passed per rectum about the sixth or seventh day. Twenty-seven cases were operated on with 14 deaths and 13 recoveries—a mortality of about 52 per cent.

Of these 27 cases operated on: *resection of intestine* was practised 15 times, with a mortality of 53 per cent.; but it will be seen in the table that 9 of these cases were under 12 years of age, while over that age the mortality was 50 per cent. The mortality, therefore, in cases of resection appears to be

between 50 per cent. and 60 per cent., independent of age, though such figures are not of very great value when calculated from so small a number of cases. *The diverticulum alone was removed* 5 times, with 3 recoveries and 2 deaths. And, considering that the age of 2 of the cases was over 5 years and of the other 3 between 10 and 20 years, 60 per cent. mortality is a high figure, in view of the comparative insignificance of the operation. *Reduction of the invaginated diverticulum without subsequent removal* was practised in 4 cases, of which 3 recovered. The case which died is reported by Cawardine,²⁷ and here an intussusception had to be reduced also, while the age of the infant was 1 year and 2 months (mortality 25 per cent.).

In two cases entero-anastomosis only, above and below the seat of obstruction, was practised with a mortality of 100 per cent.; while in one case the obstruction, which the operation failed to relieve (Maroni²²), led to a fatal termination. It would seem, from the figures, that reduction only, where feasible, has given the best results; but it is questionable whether it is wise to leave the diverticulum, in view of the possible occurrence of future trouble.

Diagnosis.—When an acute attack is at its height, the diagnosis has to be made from: (1) appendicitis, (2) volvulus, (3) tubercular peritonitis, and (4) intestinal stenosis.

It must be mentioned, however, that though the points previously referred to will often prove of considerable assistance in establishing a correct diagnosis, there is no one sign pathognomonic of invagination of Meckel's diverticulum—the recognition of the lesion must depend on the presence of a combination of signs, such as will be found only in a certain percentage of cases.

As an example, I will emphasize the importance of noticing the appearance of the umbilicus for any marked abnormality here (or a history of persistent discharge of pus or fecal matter in childhood) in conjunction with a typical history of recurrent abdominal crises, or with a palpable sausage-shaped tumor in a case where no blood has been passed per rectum,

would warrant the diagnosis of the lesion under consideration. It is unnecessary to again detail the signs already mentioned, for a combination of any of them may suffice to make a diagnosis probable, where the presence of all of them would render this probability a certainty.

From appendicitis the differentiation would depend on the past history, the age, the more gradual onset during activity, culminating in a climax of absolute constipation, the absence of marked local tenderness or rigidity, the character of the pain, etc., etc. The picture of acute appendicitis is quite different, while the recurring attacks of this disease are, as may be readily seen, of a typically different nature.

*From volvulus*¹⁰ the diagnosis should seldom be difficult, for the age, the sudden and violent nature of the onset, and a consideration of the past history, in conjunction with negative signs, should suffice to render clear the nature of the case. In volvulus, if there have been recurrent attacks, recovery from these latter will usually be accompanied by the passage of a large quantity of flatus, whereas in invagination of Meckel's diverticulum flatulence is more usual.

From subacute (possibly merging into acute) obstruction, due to tubercular peritonitis, the diagnosis may be difficult; for recurrent colicky pains with the passage of blood and possibly mucus may make the case puzzling. The pronounced wasting in such tubercular disease, the frequently putty-like faeces and the typical "feel" of such an abdomen, taken in conjunction with the absence of characteristic signs or history of the diverticular lesion, would be the main points of difference. My own case had been mistaken by the medical attendant for tubercular peritonitis.

Calmette's ophthalmotuberculin reaction might be of assistance in some cases, though my own experience has been that this reaction is less reliable in abdominal than in other forms of tuberculosis.

One case has been mistaken for *intestinal stenosis* (Ewald¹¹). No comment is required here, except to mention the association of intestinal stenosis or occlusion with hyper-

involution of the omphalomesenteric structures described by Bland-Sutton.²⁸ The establishment of such a differential diagnosis will seldom be required, and would be made on general lines after a careful attention to details.

Treatment.—Wherever the diagnosis can be made before the occurrence of the final acute attack (and this should be possible in a certain number of cases) exploratory laparotomy with, if present, the removal of the Meckel's diverticulum, should be urged and performed. During the acute attack resection may be necessary or complete reduction may be possible.

In any case, in spite of the high proportion of recoveries recorded when the diverticulum has been left, it is correct treatment to remove this structure. When the adjacent intestine is edematous or gangrenous, there is considerable risk of the stitches giving, and in these cases it will be, I think, best to cover the sutures with an omental graft and provide efficient drainage against the possible occurrence of a fecal fistula. When the age and condition of the patient warrant resection of the intestine together with the attached gangrenous diverticulum with restoration by immediate anastomosis, this is the ideal and safest procedure; but this step will rarely be justifiable or wise in cases where reduction can so far be effected.

In conclusion I would say that lesions resulting from abnormalities in the involution of the omphalomesenteric structures, of which invagination of Meckel's diverticulum forms a small part, deserve, from their diversity and severity, more attention than has hitherto been given them.

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PERITONITIS IN CHILDREN FROM UNKNOWN SITES OF INFECTION.*

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THERE are certain phases of peritoneal inflammation in children which differ enough from those ordinarily found in adults to justify their special consideration. Children are more likely to have rapidly spreading, insidious forms of peritonitis than are adults, since they are less likely to encapsulate the inflammation. They are much less likely to be constipated during its course, and hence have less of that tympanites which is so hard for the patient, but which is a telltale to the doctor. They are much more likely to have associated cerebral symptoms, so that very competent observers are sometimes at a loss to know whether a given case is to be considered as primarily cerebral or abdominal. Again, pulmonary inflammation is often accompanied by localized abdominal pain and rigidity, so that children with beginning pneumonia are believed to have appendicitis. Pneumococcus peritonitis, either isolated or associated with other pneumococcus inflammations, is much more common in children than in adults. General gonococcus peritonitis is occasionally found. Tubercular peritonitis is common, and sometimes presents symptoms which are most difficult to interpret.

The particular form of peritonitis to which this paper refers is usually due to streptococcus infection. It spreads with great virulence through the abdomen; it is not easy of diagnosis, and is not associated with any discoverable site of infection. The following cases illustrate the subject:

CASE I.—A child of seven years, who was one of the Central American Indians sent to this country for education,

* Read before the New York Surgical Society, Oct. 14, 1908.

was admitted to St. Mary's Hospital, February 14, 1906. She had been ill for four days in her school with persistent vomiting and prostration, and was sent in with a diagnosis of gastritis or possibly typhoid fever. Her temperature was 102° , pulse 128, respiration 28. Her abdomen was tense, but was not distended. There seemed to be no point of particular tenderness, but the amount of rigidity indicated that there was an abdominal lesion. Rectal examination showed moderate tenderness on both sides, in about equal degree. Her bowels had moved with an enema. She was admitted to the Medical Division and on admission impressed the House Physician, as she had the school physician, as not being critically ill. On the next day, however, when Dr. Swift and I saw her, she seemed ill enough. Temperature 102.6° , pulse 154, respiration 36; 80,000 leucocytes, 94 per cent. polymuclear. Exploratory laparotomy was done without delay and a general peritonitis was found, with an excessive amount of pus and fibrin throughout the peritoneal cavity. The appendix seemed no more inflamed than the rest of the intestine. Streptococci were found in the pus and pure culture. There was no evidence of primary lesion. The patient died twelve hours later.

CASE II.—This case, a resident of a neighboring town, through her illness of a week illustrated a similar condition. She was three years old, was in good health until March 11, when she began to have a little fever. Next morning she vomited and her temperature went to 102° . It quickly reached 104° and stayed at about that point for a week. She vomited little during the week, and cathartics and enemas were necessary but effectual. She had an otitis media and the drum head was incised. On the night of March 17 she began to vomit persistently, and had abdominal distention. On the next morning, which was the time when I first saw her, she was in a most serious condition. She gasped and kept her mouth moving as if swallowing. Her temperature was 105° , pulse 150, respiration about 30. No lesion could be found outside of the abdomen, and even the abdomen, which was examined after a stomach washing, showed no marked rigidity. What rigidity there was, was rather less than that frequently seen with pneumonia, and was not localized, nor could any localized inflammation be made out by bimanual examination. Operation did not seem advisable. Later in the day another consultant was called from the city. He found the child's eyes

crossed, with an irregularity of the pupils, spasm and rolling of the head, and thought meningitis was present. The child, however, died in a few hours, and on autopsy acute general streptococcus peritonitis was found, with much fibrin and pus. There was no evident source of infection.

CASE III.—Another example of a similar condition was given by a girl, ten and a half years old, who came into St. Mary's Hospital after an illness of a week which began with sharp knife-like pain in the region of the umbilicus. This pain soon extended through the whole abdomen, and was accompanied by nausea and vomiting. She is said to have improved under treatment in bed for four or five days, then was seized with a chill and the abdominal pain increased, and within a few hours she was brought to the hospital with symptoms of general peritonitis. Operation was done immediately and a large amount of free whitish pus was found. The intestines were covered with thick layers of fibrin. The inflammation in the region of the appendix and right tube was slightly more marked than that in other parts of the abdomen, and the appendix was removed, but there was no evidence of perforation; it seemed about like the rest of the intestine. Bacteriological examination showed pure cultures of streptococci in chains of medium length.

She died on the following day and the autopsy showed general peritonitis, which involved the lesser as well as the greater peritoneal cavity. There was no evident source of infection.

It may be well here to refer to a case which Holt * has recorded.

A baby of six months was apparently absolutely healthy until twenty-four hours before admission to the hospital. She then showed general irritability, slight fever, four attacks of vomiting, and passed several thin green stools. By evening the mother was so alarmed that she took her to the hospital,—about eleven o'clock. The child looked ill, but was well nourished. Temperature 102°, pulse 120, respiration 30. Abdomen slightly fuller than normal, not distended. No apparent tenderness, no masses present. Rectal examination negative. She died early the next afternoon, having diarrhoea, vomiting and collapse.

Autopsy.—Acute diffuse streptococcus peritonitis. No perforation of stomach or intestine. Appendix normal. No apparent site of infection.

* Archives of Pediatrics, '03, p. 278.

The autopsy was done two hours after death. No lesions of importance were found excepting in the abdomen, and the abdominal viscera themselves were normal, but there was acute diffuse peritonitis of recent origin, with four to six ounces of turbid fluid containing flocculi of fibrin and pus; patches of fibrin on intestine and on liver and spleen. No perforations of stomach or intestines. Appendix normal. Cultures: Peritoneal exudate, liver, spleen and heart's blood gave streptococcus brevis.

NOTE (by Dr. Holt).—"Careful inquiry gave no clue as to origin of infection.

Few conditions are more obscure than acute peritonitis in infancy. Without autopsy in this case the condition could not have been recognized.

Most of the cases which have come under my observation have been of longer duration and have presented more marked tenderness, distension and vomiting. I have, however, records of at least half a dozen examples of acute peritonitis in infants (suppurative) where the origin was as obscure as in this instance.

Appendicitis is of course to be suspected in infants, as in adults, but there is no evidence whatever in this case that the appendix was involved."

MARTIN, of Philadelphia, (*ANNALS OF SURGERY*, Dec., '06, p. 917) records a similar case, aged 9 years. Generally miserable for two weeks. Pain, vomiting and diarrhoea for twenty-four hours. General abdominal tenderness on admission, with moderate muscular rigidity. Leucocytosis of 60,000. Operation: General streptococcus peritonitis without apparent site of infection. Death in three days.

MONKS (*ANNALS OF SURGERY*, June, 1908, p. 964) in describing his technic of bowel washing refers to a similar case, a child of eight years with streptococcus peritonitis without assignable cause.

BONNET (*Lyon Medicale*, Nov. 25, 1906) records the case of a child who died of purulent peritonitis, believing that the source of infection was a facial erysipelas which the mother had.

OPPENHEIMER (*Deutsch. Ztschr. Chir.*, '06, v. 83, p. 456) describes streptococcus peritonitis in a child as an accompaniment of a widely spread and most virulent erysipelas.

ROSSI (*Archiv. Ped.*, '04, p. 395) reports one case, and refers to three others, in addition to the seven which Dieulafoy had already referred to.

I know of other cases, which have occurred in the practice of my friends, which I am not at liberty to quote, and without doubt large numbers can be quoted from literature, but these are enough to call attention to the existence of this peculiar type of peritonitis.

Kerley in his recent book, "Treatment of Diseases of

Children," relates that he has seen four cases within a year, and that medical treatment in his experience was without value, since every case ended fatally. In the majority surgeons were called in consultation, but invariably advised against operation. Never having had a case recover, he states that he is not in a position to advise treatment.

However, there is surely a certain proportion of cases for whom an early operation is helpful. If the infection happens to be a *coli communis* infection instead of a *streptococcus* infection, operation may be very helpful, as is illustrated by the following case:

CASE IV.—T. McE., aged 10, came into St. Mary's Hospital April 9, 1907, having had an attack of pain in the right side of his abdomen about three weeks previously. This subsided so that he was able to go to school, but apparently he had never felt absolutely well. On the day of admission to the hospital the pain had been severe enough to cause him to leave school. He had marked rigidity in the upper right side of the abdomen and severe pain just below the costal border. Palpation of the appendiceal region showed no marked rigidity or tenderness. There was no abdominal distention. There had been no vomiting. His bowels moved with enemas.

An exploration revealed slight diffuse peritonitis. The intestines were everywhere red and congested, and there was a moderate amount of free fluid, slightly turbid, and a slight fibrinous deposit. The omentum was grayish in appearance. There were a few fragile adhesions to the right of the duodenum and about the head of the colon; excepting for these evidences of inflammation, the stomach, duodenum, gall-bladder, appendix and intestines appeared normal. The appendix was removed as the most probable site of infection. A culture from the fluid gave a growth of *coli communis*. The boy's symptoms promptly subsided and he made a good recovery. The appendix was put in alcohol, and when I studied it in detail on the following day I could force a little bubble through its wall near the tip, although there had been no evidence of a perforation there. I took this to indicate that there was a thin place there which probably had furnished the spot of exit of the infection.

In studying these cases we find that they have not presented the elements for an early diagnosis, principally because abdominal rigidity, either localized or general, is the most important symptom in making such a diagnosis in peritonitis, and this symptom has been wanting or only moderate in degree. It may, however, be an aid in similar cases to remember that this type of peritonitis is not very rare, that the symptoms are usually indefinite, that there is usually excessive vomiting, prostration, without tympanites, marked rigidity or constipation, diarrhoea often being present. The three streptococcus cases which are here recorded all had excessive vomiting, profound prostration and diarrhoea. The *coli communis* case was much less virulent and gave signs of a peritonitis localized in the right hypochondrium, with no particular difficulty in diagnosis.

The type should be especially considered among children's diseases because of the symptoms, which differ materially from those of adults, and because it occurs so much more frequently in children than in adults.

The studies of Oppenheimer (loc. cit.), Noetzel (*Berl. klin. Chir.*, 47, 241), Clairmont and Ranzi (*Archiv f. klin. Chir.*, 68-76), which covers 1149 cases of peritonitis, indicate great rarity of peritonitis without assignable site of infection in adults.

Besides a clinical interest in this type of peritonitis, there is a scholastic interest as to the manner of infection. It is believed that the infection usually takes place by the passage of the germs through the intestinal wall. There is an extensive literature on this subject. I will only refer to three observers.

Bond (*Brit. Med. J.*, '06, ii.) has carefully reviewed the subject and calls attention particularly to the infection which exists in hernial sacs as showing the passage of germs through the intestinal wall. Where there is a combination of distended bowels with retarded blood supply, of fecal culture media in the intestine and of virulent organisms, there is a strong likelihood that peritonitis will result. This condition is more likely

to occur in the appendix than in any other part of the intestine, and the wall of the appendix is less likely to resist the passage of the germs.

Jensen (*Archiv. f. klin. Chirurgie*, 1903, vol. 69, 1134; vol. 70, 91) studied pneumococcus peritonitis, and among other experiments he fed four animals on virulent cultures of pneumococci in capsules. One of the animals died with pneumococcus peritonitis, and at the autopsy he found follicular enteritis with slight necrosis of Peyer's patches, but no ulcer and no perforation. The pneumococci were found in the intestinal canal, the intestinal wall, the blood and the peritoneum.

Flexner (*Johns Hopkins Bulletin*, 1895) found diplococci within the lumen of the intestine, in its wall nearly to the muscularis mucosa, and within the peritoneum, and also in spaces where he believed the lymphatics furnished the avenue of transit into the peritoneal cavity.

DIFFUSE SEPTIC PERITONITIS, DUE TO APPENDICITIS.

WITH REFERENCE TO AFTER-TREATMENT WITH POSTURAL DRAINAGE.

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FROM July 1, 1898, to January 1, 1908, there were treated in this hospital, exclusive of the service of Dr. Robert Abbe, 69 well-marked cases of diffuse septic peritonitis, *i.e.*, cases in which the entire greater sac was involved. Care has been taken to exclude from this series all lesions which might possibly have been interpreted as spreading processes, by which is meant an inflammation located in one quadrant or half of the abdominal cavity, not confined by adhesions. An analysis of the cases occurring during these successive years has been undertaken.

1898. Four cases were operated upon (one case not included died on the table before the abdomen was opened); 100 per cent. succumbed to combined shock and sepsis. All but one case, which survived five days, died during the first twenty-four hours. The earliest operative interference was instituted on the third day of appendicitis, the latest on the seventh day of the disease.

Operative Procedure.—(1) Incision. Preference was given to multiple incisions, seven and one-half centimetres, with openings for counter-drainage in both flanks. The manner of dealing with the appendix need not detain us. (2) Flushing. Irrigation of the peritoneal cavity with normal salt solution at a temperature of 110° F. was practiced in all four cases, the septic material being sponged away and dried. (3) Drainage. To dismiss this subject summarily, all the cases observed over a period of ten years were drained. In cases in which multiple openings were made, each incision received a tube of glass or rubber (for the most part rubber)

with an iodoform gauze wick directed down into the pelvis, up toward the diaphragm or among the intestinal coils. In other cases a Mickulitz or a *cigarette* drain was employed, and incision partially sutured in the usual manner.

After-treatment.—The after-care covering the four cases of 1898 was as follows: Immediately following operation but small quantities of water were given by mouth, later restricted fluids. The wound was dressed each day and irrigation through the drainage-tubes practiced with hot normal salt solution. Saline enemas were administered to be retained, every one or two hours for three injections, or continuous saline irrigation every four hours for fifteen minutes was given. Stimulating and nutrient enemas were given. Lavage for persistent vomiting was resorted to and either castor oil or magnesium sulphate left in the stomach.

1899. Eleven cases were operated upon; all but one died, succumbing to causes other than complications, making a mortality of 90.9 per cent. The case which survived was operated upon on the third day of the disease, as were four others. The earliest mechanical intervention was on the third day, the latest on the twenty-first day of the disease. Of the remaining six fatal cases, one received operative treatment on the twenty-first day, one on the eighth, one on the seventh, one on the sixth, one on the fourth, and one on the second day of the disease. Of the ten deaths, seven occurred during the first twenty-four hours, one on the second day following operation, one on the third and one on the fourth.

Operative Procedure.—(1) Incisions were slightly larger, multiple in all cases for counter-drainage. (2) Flushing was practiced in eight cases, in three it was not. The single case which recovered was irrigated.

After-treatment.—In brief it was as in the preceding year. Magnesium sulphate was occasionally added to the saline irrigation of the rectum. Oil enemas and the usual medicated enemas were given (magnesium sulphate, ox-gall, turpentine, glycerine, etc.). In one case, salts were injected into the intestine, as recommended by Dr. McCosh. One case received

magnesium sulphate (two drachms) every hour by mouth for four doses. Calomel in serial or single doses was given on the first or second day following operation. Croton oil was used in a few isolated cases, one minim on the tongue, or in some cases given in the enema. In addition to usual stimulants as heretofore employed, Credé's inunction found favor in some cases.

1900. Eight cases were operated upon with but two recoveries (mortality of 75 per cent.). Of these recoveries one was treated by operation on the first day and was discharged cured in thirty-three days, the other was operated upon on the third day and was discharged cured in thirty-six days. Of the six fatal cases, three survived the twenty-four hour period, death occurring on the third to the fifth day from combined shock and sepsis. Three died within the first twenty-four hours without complications.

Operative Procedure.—(1) In the majority of cases a seven and one-half centimetre intermuscular incision was made directly over the appendix; in a few a median incision; in all cases multiple incisions for counter-drainage. Puncture of the transverse colon was made in one case with subsequent suture. (2) Six cases were irrigated and two were not. The two cases which survived were flushed out in the manner described.

After-treatment.—(1) The wound received attention as heretofore, and was irrigated through the drains with half strength borosal solution. No new or other method of treatment not already described was employed. (2) Postural drainage. In April of this year Dr. George Ryerson Fowler¹ published an account of the advantages of the Elevated Head and Trunk Position. Of eight cases occurring in this hospital in 1900, this method of treatment was adopted in one case with one death. In this case the trunk was elevated on the operating table during irrigation of the peritoneal cavity. The patient was in extremis when brought to the hospital and profoundly septic, and died three days after operation. Of seven cases not treated by postural drainage two recovered.

¹ Med. Rec., vol. lviii, No. 15, p. 617, 1900.

1901. Five cases were operated upon with two deaths (mortality of 40 per cent.). Of the three cases which recovered, one received operative treatment on the third day, one on the seventh and one on the thirteenth day of the disease. The average stay in the hospital was sixty-four days. The longest period of convalescence was seventy-four days, being protracted by an enterostomy. The two deaths, one occurring on the third day and one on the fourth day, were attributed to sepsis and shock independent of intercurrent affections.

Operative Procedure.—(1) Incision as before over the appendix, sufficiently large to deal satisfactorily with the organ. (2) Flushing. Lavage of the peritoneum with normal salt solution was done in four cases. Two patients recovered.

After-treatment.—(1) Consisted in such measures as hitherto practiced with the following exceptions: Six cases received irrigation through the drainage tubes, some with borosal (one-half strength), others with hydrogen peroxide followed by normal salt. In one case an incision was made into the intestine two days after operation, the contents evacuated and the incision closed by suture. In two instances an enterostomy was performed; one died, the other was cured. (2) Postural drainage. The bedside notes indicate that this treatment was carried out in but one case. The patient recovered.

1902. Two cases were operated upon with two deaths. In these cases death was due to shock and sepsis; in one, operation was undertaken on the second day, this case survived two days, and in the other case on the third day. This case succumbed on the eighth day after operation.

Operative Procedure.—(1) Incision. Single incisions $7\frac{1}{2}$ to 15 centimetres long. (2) Flushing was practiced in one case.

After-treatment.—Rectal irrigations, enemas, etc., as before. In one case an inguinal colostomy was performed on the tenth day after operation and the intestine irrigated. This was followed by continuous irrigation of the rectum up to the time

of death. Postural drainage. The nurses' notes fail to state that advantage was taken of the postural position.

1903. Four cases were treated by operation and four deaths occurred, exclusive of complications.

Operative Procedure.—The cases were in extremis at time of operation. Multiple incisions were made for counter-drainage, effected by rubber tubes as heretofore. Two cases were irrigated; two were not.

After-treatment.—(1) This differed in no way from the ordinary routine of the preceding years. In one case the caecum was incised, the contents evacuated, followed by instillation of magnesium sulphate and oleum tiglii. (2) Postural drainage was instituted in four cases.

1904. Ten cases were operated upon with three recoveries (70 per cent. mortality.). The average period of convalescence was twenty-eight and one-half days. Of seven fatalities all cases survived twenty-four hours, except one which died on the table.

Operative Procedure.—Incisions were multiple and single from 7 to 15 centimetres. Irrigation was performed in eight cases, in two it was not. Two cases irrigated recovered, as did one case which was not.

After-treatment.—(1) In general terms, as previously indicated. Two of the three cases of favorable termination received irrigation through the drainage-tubes, also magnesium sulphate by mouth. In one fatal case the management was, in addition to that indicated, injection of magnesium sulphate into the bowel after the manner of McCosh. (2) Postural drainage was instituted in six cases with three recoveries; in four it was not. One case of the latter died on the table.

1905. Seven cases were operated upon with four deaths, a mortality of 57.1 per cent. An average of thirty-eight and one-half days' convalescence is noted. Of the fatalities, all due to shock and sepsis, two occurred within twenty-four hours after operation. One lived three days and one six days after operation.

Operative Procedure.—Three favorable cases. (1) In-

termuscular incision with Mickulitz drain. (2) Seven centimetre intermuscular incision with gauze drain. (3) Incision at outer border of rectus muscle, with rubber tube drain. The fatal cases received multiple incisions or a 15 centimetre single median incision, with rubber tube drainage, except one which had *cigarette* drainage. Flushing was practiced in four cases with two recoveries; in three it was not, with one recovery.

After-treatment.—(1) The three cases terminating in recovery were irrigated with borosal (one-half strength). This was practiced in one of the four fatal cases. Eserin salicylate was given in one case with recovery and in two cases with two deaths. The other details were as given above. (2) Postural drainage was used in the three cases which recovered and in two of the cases which died. One of the latter was in *extremis* before operation and succumbed just after the first twenty-four-hour period. Two died that did not receive postural drainage.

1906. Seven cases were operated upon with five deaths (71.4 per cent. mortality). The two cases which were cured left the hospital on the thirtieth and sixtieth day respectively. Of the fatal cases, one died two hours after operation, performed on the fifth day. Another case also operated upon on the fifth day survived twenty-four hours; two lived two days, one operated upon on the first day and the other on the third day of the disease.

Operative Procedure.—(1) Incision. Seven-centimetre intermuscular incision in the right iliac region was made in two favorable cases; the same was performed in the remaining five, except two which received multiple incisions. Flushing. Three cases were irrigated, with two deaths, and four were not, with three deaths.

After-treatment.—The main features were as given in the previous years. Postural drainage. Four of the seven cases were placed in the semi-sitting posture, with two deaths; one was in *extremis* before operation and survived but two

hours. Three deaths occurred in three cases not treated in this way.

1907. Eleven cases were operated upon with four deaths (36.3 per cent. mortality). The operation was performed on the second day, thirty-sixth hour, third, fourth, fifth, sixth, and seventh day respectively in the cases terminating in recovery. The average stay in the hospital was forty-one and one-half days, the longest necessitated by the development of a secondary pelvic abscess. Of the fatal cases, two were operated upon on the second day; one of these developed four days later intestinal obstruction, angulation freed by operation, and one day later, fifth day after original operation, an enterostomy was performed. The patient died on the ninth day of shock and sepsis. The other case died on the second day after operation. Of the two remaining fatal cases, death occurred in one, on the third day, and in the other twenty-four hours after operation.

Operative Procedure.—(1) Incision. Seven and one-half centimetre intermuscular incision in all cases. A secondary operation was necessary to free a kink giving rise to intestinal obstruction on the fourth day after operation in one case; on the fifth day an enterostomy was performed. (2) Flushing was carried out in ten cases, with three deaths; in one it was not, with one death. Postural drainage was instituted in all cases.

After careful consideration of these cases and the results of others, the following conclusions are reached:

1. We must look for a lowering of the high mortality rate in early operation, rather than in any further development in mechanical intervention. Dr. Blake's² statistics in spreading peritonitis show a mortality of 14.3 per cent. (21 cases).
2. Early institution of postural drainage. This is of greater aid in preventing septic material from reaching the diaphragmatic peritoneum than in preventing further absorption.

² Treatment of Diffuse Septic Peritonitis, N. Y. and Phila. Med. Jour., Nov. 19, 1904.

tion after this area is once involved. Ambulance cases of peritonitis of this nature are frequently brought to the hospital in the sitting posture. The trunk should be elevated during lavage of the peritoneum. The manner of instituting postural drainage matters but little, provided that the pelvis is sufficiently low for gravitation to take place, and the patient is comfortable. At the German Hospital in Brooklyn a wooden frame is employed to raise the head of the bed, and a folded pillow beneath the knees, held in place by a bandage, prevents the patient from slipping. This secures an elevation of seven, thirteen or twenty inches as desired. At St. Luke's, Manhattan, a bed-rest is often employed, such as is used for cardiac cases, and the head of the bed elevated. At St. Luke's Hospital in Richmond, Va., a wooden frame is used to support the patient who lies upon a flat mattress, the head of the bed being elevated. Swings, blocks, hammocks, shoulder rests, etc., have been used for this purpose. It is difficult to maintain some patients, who are under mental strain, in the semi-sitting posture; in such cases muscular tension may be relaxed by having the patient lie flat; they are frequently unconscious of the elevation when well supported by a pillow or protected wooden rest.

3. Peritoneal lavage dilutes septic material, and when practiced should be continued until the cavity is partially closed. Plastic lymph not removed by irrigation or by simple lifting should not be disturbed.

4. Wound drainage. All cases of this nature should be drained. The ideal method, in women, is by a posterior colpotomy incision, by means of a large rubber tube. Cases not drained frequently develop pus pockets and superficial wound infections.

5. Ochsner's treatment should be instituted after operation and Murphy's proctoclysis practiced.

6. Open the abdomen by a small incision over McBurney's point, deal quickly with the primary focus, prevent evisceration and use greatest gentleness in handling parts.

The writer wishes to thank Dr. B. F. Curtis and Dr. C. L. Gibson for permission to report these cases.

ANALYTICAL TABLE.

Year.	Cases.	Deaths.	Mortality.	Irrigated.	Deaths.	Not Irrigated.	Deaths.	Postural Drainage.	Deaths.	No Postural Drainage.	Deaths.	Enterostomy.	Deaths.	Mortality.
1898	4	4	100%	4	4	0	0	0	0	4	4	0	0	93.3%
1899	11	10	90.9%	3	3	3	3	0	0	11	10	0	0	
1900	8	6	75%	6	4	2	2	1	1	7	5	0	0	
1901	5	2	40%	4	2	1	1	0	0	4	2	1	1	
1902	2	2	100%	1	1	1	1	0	0	2	2	0	0	
1903	4	4	100%	2	2	2	2	2	4	0	0	0	0	
1904	10	7	70%	8	6	2	1	3	3	4	4	0	0	
1905	7	4	57.1%	4	2	3	2	2	2	2	2	0	0	
1906	7	5	71.4%	3	2	4	3	4	2	3	3	0	0	
1907	11	4	36.3%	10	3	1	1	11	4	0	0	1	1	
Total	69	48	70%	50	33	19	15	32	16	22	18	4	3	
Mortality	69.5%	.....	66%	78.9%	.....	* 50%	.....	* 81.8%	.....	75%	.....	0	0	62.9%

* Statistics since 1900, *i. e.*, adoption of postural drainage.

THE INTERLOCKING SUTURE.

BY RAYMOND CUSTER TURCK, M.D.,
OF JACKSONVILLE, FLA.

IN 1903 the writer reported a modification of the Connell suture for end-to-end intestinal anastomosis.¹ In that paper attention was called to the results obtained in something over two thousand abdominal operations upon living dogs, performed at the Chicago Post-Graduate Laboratory of Anatomy and Operative Surgery, under aseptic conditions. In the discussion of the various forms of intestinal suture, mention was made of the fact that 35 per cent. of dogs died of a peritonitis resulting from leakage between sutures, in operations where the interrupted Lembert suture was used.

Later work has fully confirmed the above findings. It must be stated, however, that the large mortality in Lembert operations upon the dog does not apply to like procedures upon the human, the human peritoneum being much less susceptible to fatal peritonitis from leakage or infection than that of the dog, and while the interrupted Lembert has been practically abandoned in abdominal work upon the dog, yet that form of suture is still used upon the human intestinal tract with but an occasional death from peritonitis, the result of leakage.

The primary Lembert principle, that of inversion of cut edges and union of relatively broad peritoneal surfaces, has not, however, as yet been improved upon, improvement having been only in the manner of the application of that principle.

The first form of modification, that is, the Czerny-Lembert suture, is stronger and less liable to leakage than the Lembert alone, even when the Lembert is used in double rows.

The second modification form, the double Lembert (*i.e.*, Halsted's mattress suture) is not only more rapidly inserted,

¹ Modification of the Connell Suture, *Journal of the Amer. Medical Assoc.*, March 7, 1903.

because of one knot for each two sutures, but it lessens the danger of leakage between sutures by exactly one-half, and so far as rapidity of insertion, strength, and safety are concerned, for general use on the human, it is perhaps the most practical application of the Lembert principle. As will be considered later, however, to insure against ordinary leakage, because of the longitudinal as well as lateral tension, the Halsted mattress sutures must be inserted much more closely together, than when the single Lemberts are used.

Wherever a continuous suture is advantageous, the continuous Lembert, (*i.e.*, the Cushing stitch, the Dupuytren modification, or the Richardson suture, in all of which the needle bites are taken not parallel but at right angles to the line of union), affords the greatest rapidity of insertion, as well as practical insurance against leakage, strength only, as in all continuous sutures, being the wanting factor.

In end-to-end intestinal anastomosis by the Connell method, the mortality in 400 operations upon dogs was reported by the writer, in 1903, as a trifle less than 3 per cent. In this recorded series the work was done by the Post-Graduate Faculty, by students working under a demonstrator, by independent investigators, and by students working alone. The mortality directly traceable to the Connell anastomosis in operations performed by experienced men was less than one-half of one per cent.

While the Connell operation apparently fulfils every indication in end-to-end anastomosis, yet it is not applicable to many operations encountered in visceral surgery. The Czerny-Lembert, the closely placed Halsted, the continuous Cushing, the Richardson, the double row of continuous overhand sutures, or the Murphy button fulfil nearly every other indication.

Conditions are encountered, however, in which not only strength of suture, but positive insurance against leakage is wanted; ease and rapidity of suture insertion, while desirable, being of secondary consideration.

As a fulfilment of this indication the writer devised and

reported an interrupted interlocking mattress suture.² This suture is a modified Halsted, embodying all the advantages of the Lembert principle, and, if properly inserted, is absolutely proof against leakage.

Consideration of the ordinary Halsted sutures demonstrates (Fig. 2) that when the sutures are tied there is a pull in two directions, viz., at right angles to the line of union, and parallel to the line of approximation. It will be noted that in tying the knots, the spaces between sutures are increased,

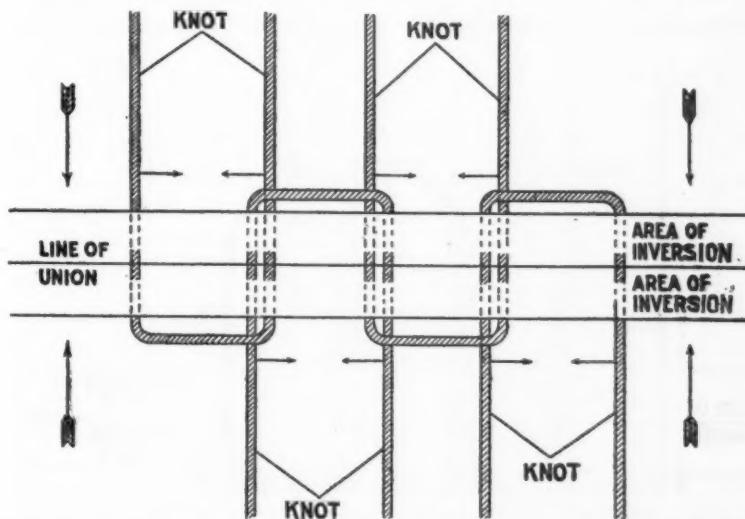


DIAGRAM 1.—Interlocking suture with knots alternating on each side of line of union. Arrows indicate direction of suture tension. Lembert principle of inversion.

the danger and probability of leakage increasing accordingly. In fact, observation of operations upon dogs demonstrated that when single Lemberts and Halsted mattress sutures were inserted with equal spacing, the percentage of leakage peritonitis was greater with the Halsted than with the Lembert. To obviate this danger, and at the same time to utilize the clear advantages of the Halsted stitch, the halves of the Halsteds were placed slightly further apart, while the different

² An Intestinal Suture, Journal of the American Med. Assoc., Jan. 27, 1900.

sutures were inserted as closely together as possible. As a result of this method, no leakage occurred in operations upon the small bowel; peritonitis resulted, however, in a few cases of colonic resection.

The next step was naturally an overlapping of the mattress sutures, and from this the interlocking suture was evolved. In a word the interrupted interlocking suture is but the Halsted mattress suture, overlapped and interlocking, forming, when all knots are tied, a complete chain of stitches through which no leakage is possible. The suture can be inserted with knots alternating on each side of the line of union (Diagram 1)

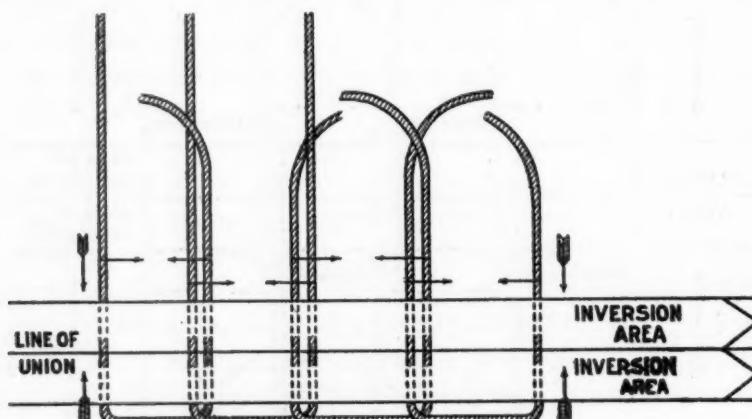
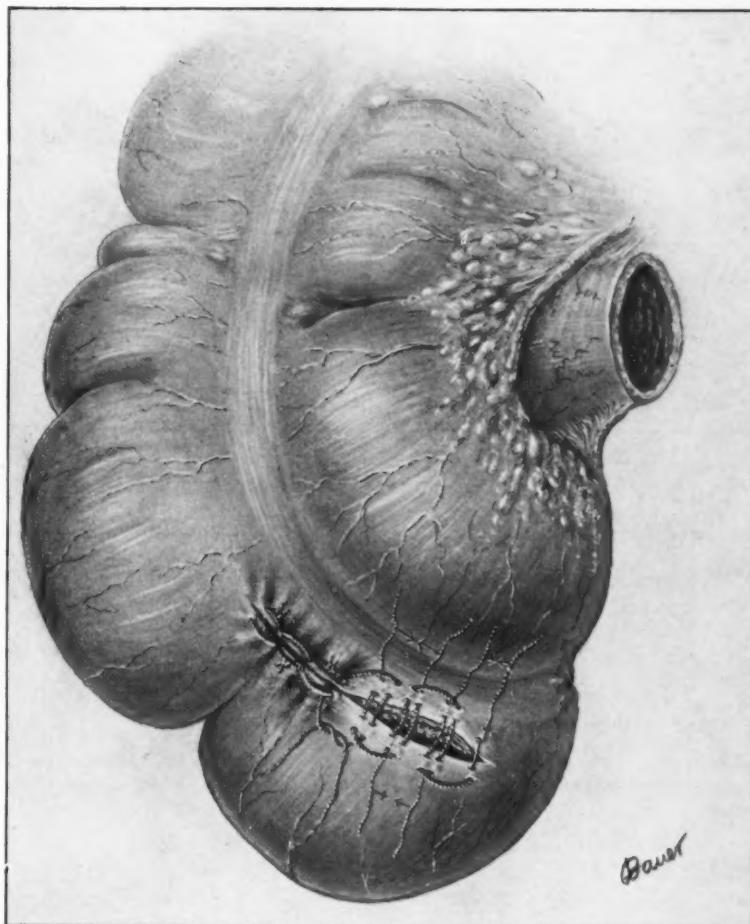


DIAGRAM 2.—Interlocking suture with knots on one side of line of union. Arrows indicate direction of suture tension. Lembert principle of inversion.

or with knots all on one side (Diagram 2). In either case but slight overlapping is necessary, though care should be taken in both instances that the first half of each succeeding suture passes *under the loop* and *over the loose end* of the suture immediately preceding, so that when all knots are tied a complete chain of stitches is formed (Figs. 1 and 3.).

A glance at the diagrams, and consideration of the direction of suture tension as indicated by the arrowheads, demonstrates that there are no non-approximated points in the line of union, and that *stitch leakage*, barring a slough, is *entirely eliminated*. So far as strength is concerned, because of the

FIG. 1.



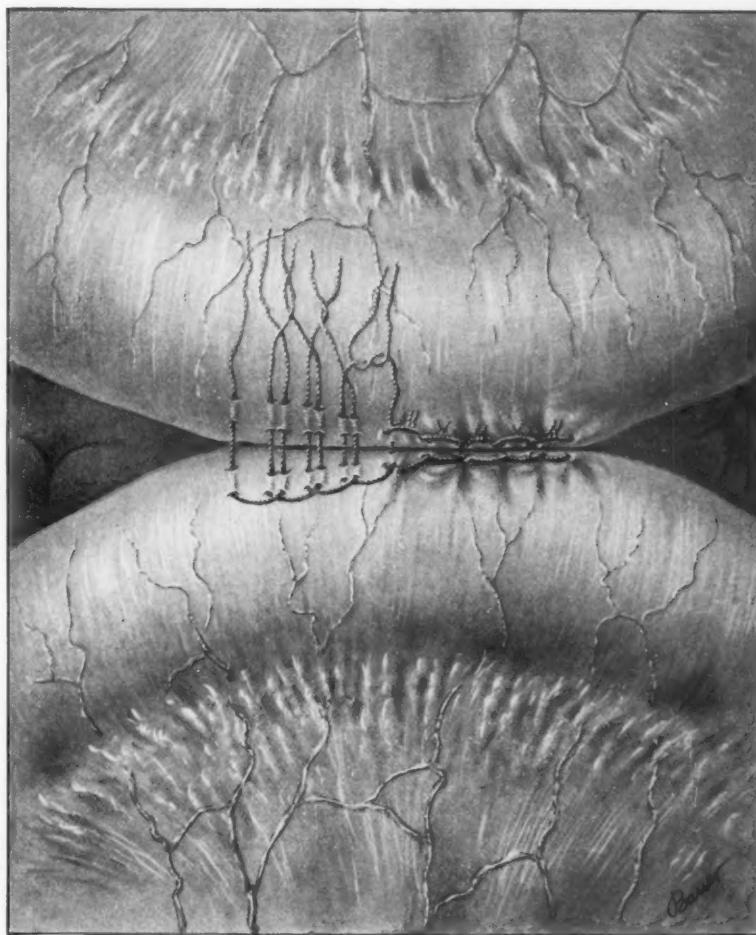
Closure with interlocking sutures. Alternating knots. This suture is simple and easy of insertion if it is remembered that all loose ends pass under the loops. The knots are purposely shown loosely tied, to more fully illustrate the interlocking chain arrangement.

FIG. 2.



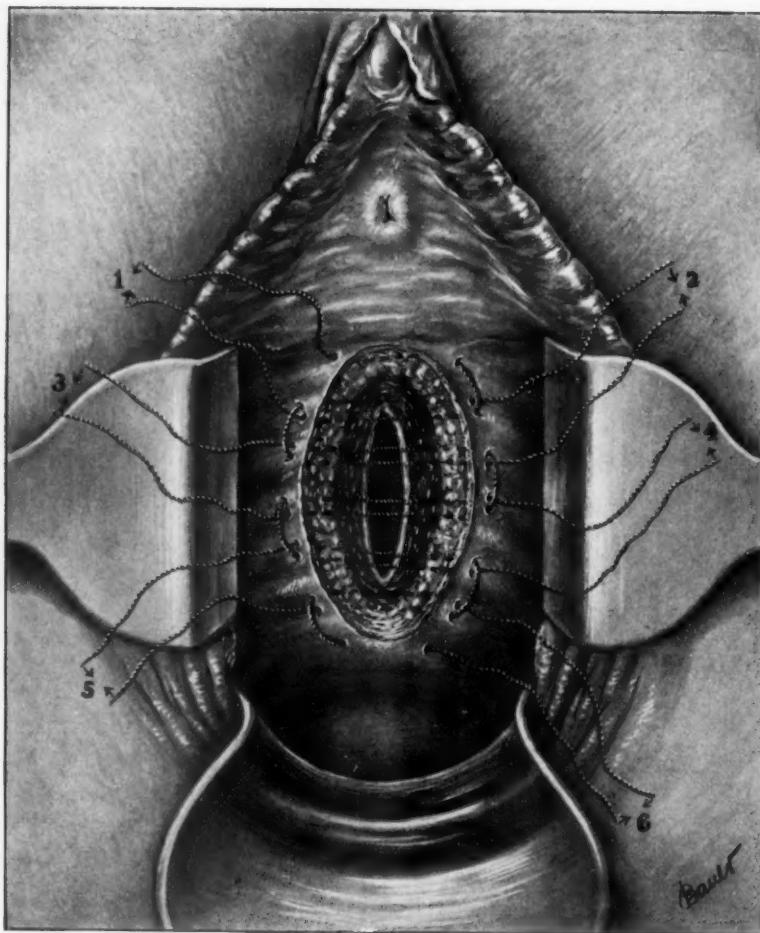
Halsted mattress sutures. Illustrating the manner in which spaces between sutures are increased upon tying the knots. This feature is exaggerated in the drawing to more fully bring out the weak points.

FIG. 3.



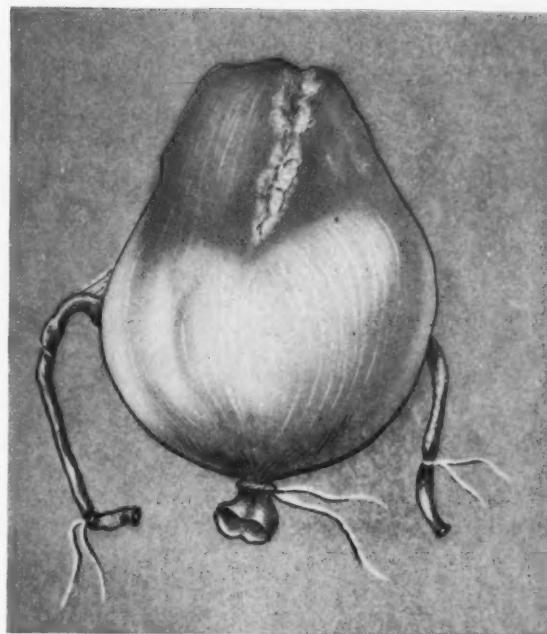
Interlocking suture with all knots on one side. Showing manner of insertion of loops, and crossing of loose ends to form the chain.

FIG. 4.



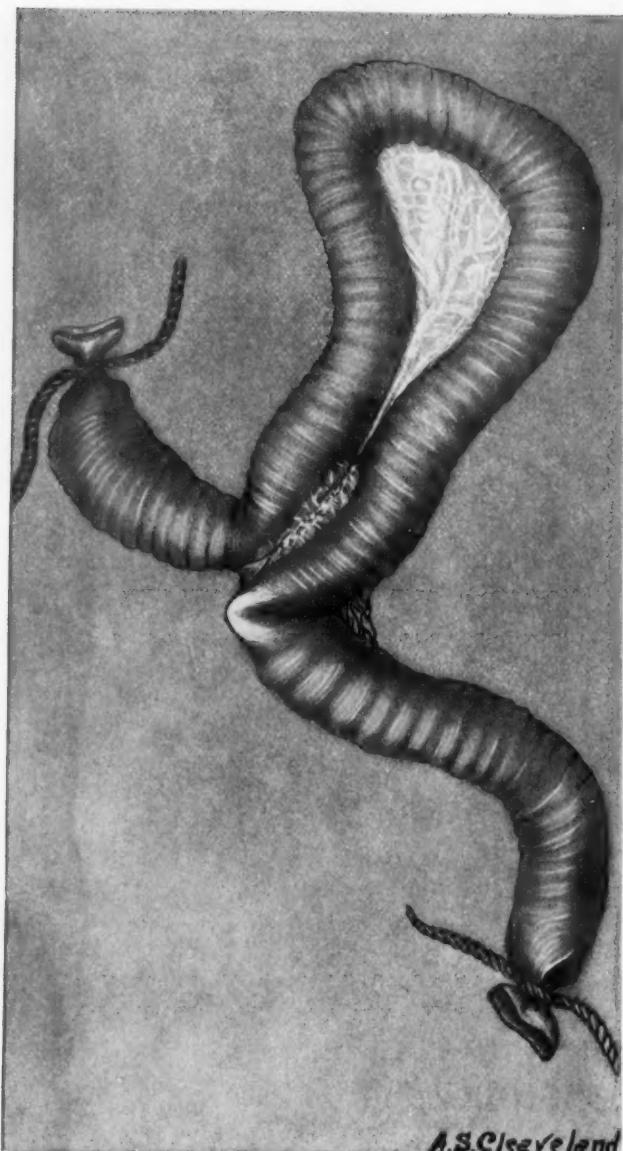
Closure of vesicovaginal fistula showing the interlocking suture inserted as in surface wound suturing, in such a manner as to approximate the raw edges without inversion.

FIG. 5.



Bladder of dog. Four weeks after resection and suture with interlocking stitch.

FIG. 6.



A.S.Cleve/land

Bowel of dog. After lateral anastomosis with interlocking suture.

interrupted interlocking feature, the completed chain is obviously stronger than any other form of interrupted or continuous suture, each stitch supporting and being supported by its neighbors. While the interlocking suture is perhaps not as easily and rapidly placed as other forms of interrupted stitch, yet there is but little difference since one interlocked suture covers the ground of about three Lemberts, or one and one-half Halsteds. It is not possible to properly form the chain of stitches if each is tied as soon as taken. The first and second sutures are inserted, the first is then tied; the third inserted while the second is loose, the second then tied; the fourth inserted, the third tied, and so on, always tying one stitch behind.

The interlocking stitch may be applied as in ordinary surface wound suturing, without the Lembert inversion of cut edges, so that when the sutures are tied the cut edges will be approximated. Figure 4 is illustrative of this method of wound closure.

In an extended series of experiments upon dogs, in which operations were performed on stomach, pylorus, small intestine, colon, and rectum, in no instance did we find post-mortem or secondary operative evidence of leakage, and in no case did we find sloughing from suture pressure. I note three deaths from peritonitis in a series of 100, in none of which was leakage recorded, post-mortem evidence showing the peritonitis to be general and probably due to faulty technic and infection during the operation.

Twenty-five operations upon the bladders of dogs, varying from simple incision and closure with the interlocking suture, to removal of two-thirds of the viscous, showed no leakage and no deaths.

A series of experiments upon blood vessels with interlocking sutures of fine silk was begun, but unfortunately not completed owing to the writer's removal from Chicago. The results obtained, while not complete nor extensive enough for definite conclusions, were very promising and indicated that

interlocking sutures may have a place in venous and arterial surgery.

The suture, while not necessary in a majority of alimentary tract operations, is peculiarly applicable to those conditions in which post-operative suture leakage is to be utterly eliminated, such as in certain operations upon cæcum, colon, and rectum. It is also of value in operations upon gall-bladder, ducts, urinary bladder, and blood-vessels.

The following cases of the writer are reported as illustrative of the range of applicability of this stitch:

CASE I.—*Suture of the Hepatic Duct After Removal of Large Stone.*—This case was reported in detail in *ANNALS OF SURGERY* for April, 1903.

Two stones were removed from an enlarged, elongated and distended gall-bladder, one from the cystic duct, and a non-faceted stone, weighing 250 grains, measuring one and three-fourths inches in length and three and one-fourth inches in circumference, was removed from the hepatic duct through an anterior longitudinal duct incision.

The liver was retracted upward, the stomach and duodenum were retracted downward and to the left, tension sutures were placed at each end of the hepatic duct incision, and the opening in the duct closed by the interlocking suture (with knots alternating). Drainage was established through the resected gall-bladder.

This case demonstrates that by proper visceral retraction and packing off, and by use of traction sutures to immobilize the part to be closed, the interlocking stitch may readily be properly inserted in any locality accessible to any form of interrupted or continuous suture.

CASE II.—*Suture of Bladder.*—Mr. B., age 38. Left bubonocele, large, right, partly strangulated and inflamed scrotal hernia.

The bubonocele on the left side was closed by the Ferguson anatomic method without incident. On the right side the usual skin incision was made, the aponeurosis of the external oblique recognized and split upward to fully expose the sac and canal. Sac appeared hypertrophied and in a high state of congestion and inflammation. In attempting to isolate and open the sac a gush of fluid, easily recognized as urine, showed that the bladder had been inadvertently opened. In freeing the bladder a partial pro-

lapse of that viscus was demonstrated. The opening in the bladder was closed by one row of interrupted interlocking sutures (alternating knots) without Lembert inversion of edges. The sac was freed, and split up to the internal ring. The contained bowel and omentum, while highly congested, were not gangrenous, and were replaced in the abdominal cavity. The sac was removed and the operation completed as usual by the method of Ferguson. A few strands of silkworm gut were inserted as a drainage insurance.

Both wounds healed without incident, except for a slight superficial skin infection on right side. Drainage did not prove necessary. There was no urinary leakage, nor cystitis, nor at any time clinical indication that the bladder had been tampered with or irritated.

CASE III.—*Suture of Axillary Vein.*—Mrs. S., age 47. Operated in 1903 for extensive carcinoma of left breast, with marked involvement of glands in the axilla and in the subclavian triangle. A typical Halsted amputation was done,—the axillary space, the subclavian triangle, the space between them and beneath the clavicle were thoroughly cleared. Several enlarged axillary glands were attached to the axillary vein so closely as to necessitate sharp dissection. All were removed, however, without injury to the vein, except one near the clavicle. In removing this gland, a slightly ragged lateral hole was cut or torn in the vein, equal in length to a little more than one-third the circumference of the vein. Because of the high location of the tear, I wished to avoid ligation if possible.

A purse-string suture of fine silk was inserted, cut edges of vein inverted, and the suture tightened. This, however, so reduced the calibre of the vessel that the procedure seemed unwise; the purse-string, therefore, was removed and the opening in the vein closed by one row of interrupted interlocking sutures of fine silk. Lembert inversion (alternating knots). Upon relieving compression and allowing the blood-current to flow through the vein, no leakage was discernible, and no additional reinforcing sutures were necessary.

The skin incisions were closed as usual, and the patient was constantly watched for a period of three weeks. There were at no time symptoms of leakage from the sutured vein, nor more than the usual amount of drainage.

There was no œdema of the arm, no circulatory disturbance, and no venous congestion. The patient recovered without untoward symptoms, death occurring fourteen months later from local recurrence of the cancer, with general metastasis.

CASE IV.—*Typhoid Ulcer*.—Mr. R., age 32. Uneventful mild typhoid course for two weeks, when two slight hemorrhages occurred. In the early morning (4 A.M.) following he had a sudden sharp abdominal pain, seemingly more or less diffuse. After this subsided the patient remained fairly comfortable except for an occasional nausea and very moderate vomiting. The pulse and temperature rose during the forenoon and afternoon, the abdomen became tympanitic, with marked tenderness in the right lower quadrant. There were no symptoms of collapse. Blood count two days previously showed total leucocytes 6400, neutrophiles 76 per cent., small mononuclears 12 per cent., large mononuclears and transitionals 10 per cent., neutrophilic myelocytes 2 per cent. At 6 P.M. the day of the pain the total leucocytes were 18,200, neutrophiles 88 per cent., small mononuclears 4 per cent., large mononuclears and transitionals 8 per cent. Diagnosis was made of perforating ulcer, and operation performed fourteen hours after the attack of acute pain. An incision was made through the right rectus. A perforation was found in the ileum, approximately eleven inches from the ileoçæcal valve. The opening was closed with one row of interrupted interlocking sutures of chromic gut (knots all on one side). No attempt was made to sponge more than the immediate vicinity of the ulcer. No irrigation or flushing was attempted, drainage was inserted, and the wound closed as rapidly as possible. The patient was placed in the Fowler position, and proctoclysis (Murphy) instituted. Reaction was prompt, the peritonitis did not become severe, and the patient recovered nicely from the immediate operation, later going to full recovery from the typhoid.

The blood findings in this case are pertinent, first, as regards prognosis. The prompt rise in neutrophilic cells showed that systemic reaction, and resistance to the peritoneal infection were active and strong, and hence lent a favorable aspect to the case; second, in view of the sudden neutrophilic hyperleucocytosis following the sharp abdominal pains, with rise of pulse, temperature and tympany, the diagnosis could scarcely be mistaken.

CASE V.—*Suprapubic Cystotomy and Perineal Section*.—Mr.

Y., age 47. A median perineal section was made for the removal of a large imbedded vesical calculus. The stone was loosened, crushed, and removed piecemeal through the perineal incision. The vesical mucosa was the seat of a papillomatous growth, and fearing malignancy a suprapubic incision was made and the bladder opened extraperitoneally. Removal of the growth and sharp curettage showing no apparent involvement of the vesical muscularis, the upper opening in the bladder was closed by one row of interlocking sutures without Lembert inversion, and drainage established *via* perineum.

The patient ran the usual course of convalescence without symptoms of note, eventually recovering with but slight chronic cystitis. Suprapubic wounds healed kindly. No leakage.

CASE VI.—*Suprapubic Cystotomy*.—Mr. P., age 29. This patient had a vesical calculus, with apparently but a moderate cystitis. A suprapubic incision was made and the bladder opened extraperitoneally. The stone was removed, the vesical mucosa swabbed with a solution of nitrate of silver, thoroughly irrigated with hot boric solution, and because of the apparently good condition of the mucosa the bladder was closed with one row of interrupted interlocking sutures of formaldehyde gut (without Lembert inversion) without vesical drainage.

After operation the bladder was irrigated daily. The patient's immediate recovery was excellent. There was no sign of leakage, nor wound infection. While this case is illustrative of the prevention of leakage by the interlocking suture, yet an error was made in not establishing drainage, as is shown by the fact that cystitis persisted until I lost track of the case, a year later.

CASE VII.—*Fecal Fistula*.—Mr. Le M., age 42. First operation April, 1903, for appendiceal abscess. An incision was made well outward toward the anterior superior spine. Cæcum, ileum, and omentum were found to be a mass of agglutinated adhesions, with marked chronic inflammation and hypertrophy. Pus was deep and completely walled off. In clearing the adhesions to get down to the pus, a hole an inch in length was torn in the cæcum. This was closed by a continuous Cushing suture of catgut. The pus was evacuated, and a Mickulitz gauze-rubber tube drain inserted. Drainage was profuse, and fecal matter was detected in the dressings on the fourth day. Patient recovered rapidly with the sinus still discharging faeces. The fecal discharge continued

PRIMARY SARCOMA OF THE PERITONEUM.

BY J. M. ELDER, M.D.,

OF MONTREAL, CANADA.

THE paucity of surgical literature on the subject of primary sarcomatous tumors of the peritoneum and the interesting post-mortem findings regarding the questions of rapid tumor growth and metastases in the case which came to autopsy, justify me in publishing these two cases, both of which occurred in the Montreal General Hospital during the summer of 1907.

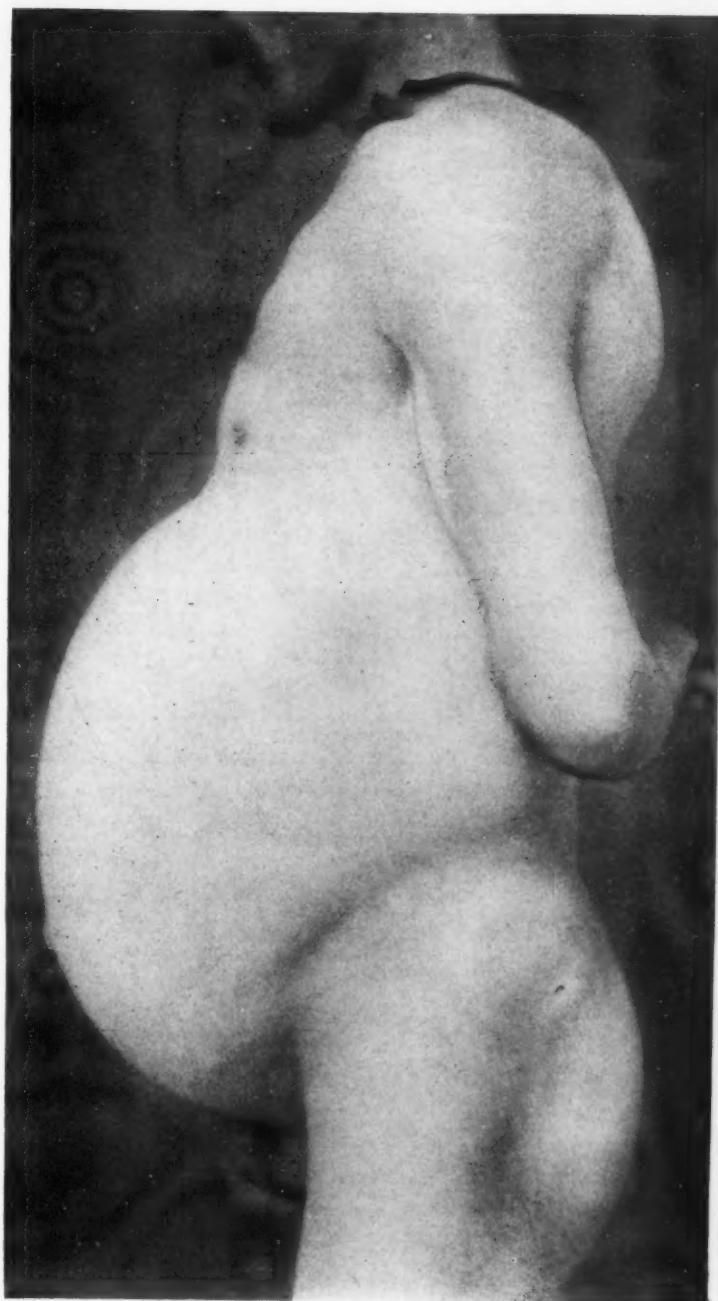
CASE I.—(561 M., 862 S., 1907 M. G. H. Reports.) N. M., sailor, aged 33, admitted to the service of Dr. Lafleur, June 22, 1907, complaining of swelling of the abdomen. Family history good; personal history negative except that he has been a hard drinker since he was 15 years of age.

Present illness.—Began nine months ago, when he decided that he did not feel as strong as before and therefore secured employment ashore. Three months later he noticed swelling of the abdomen, but attributed his supposed corpulence to drink and easy work. This abdominal enlargement gradually increased but without producing distress to the patient until a truss, which he had worn for years, became too small. He vomited several times during the summer of 1906, chiefly his breakfast, but attributed this to too much beer the night before. He had no pain or swelling of the lower extremities. There was slight dyspnoea on exertion.

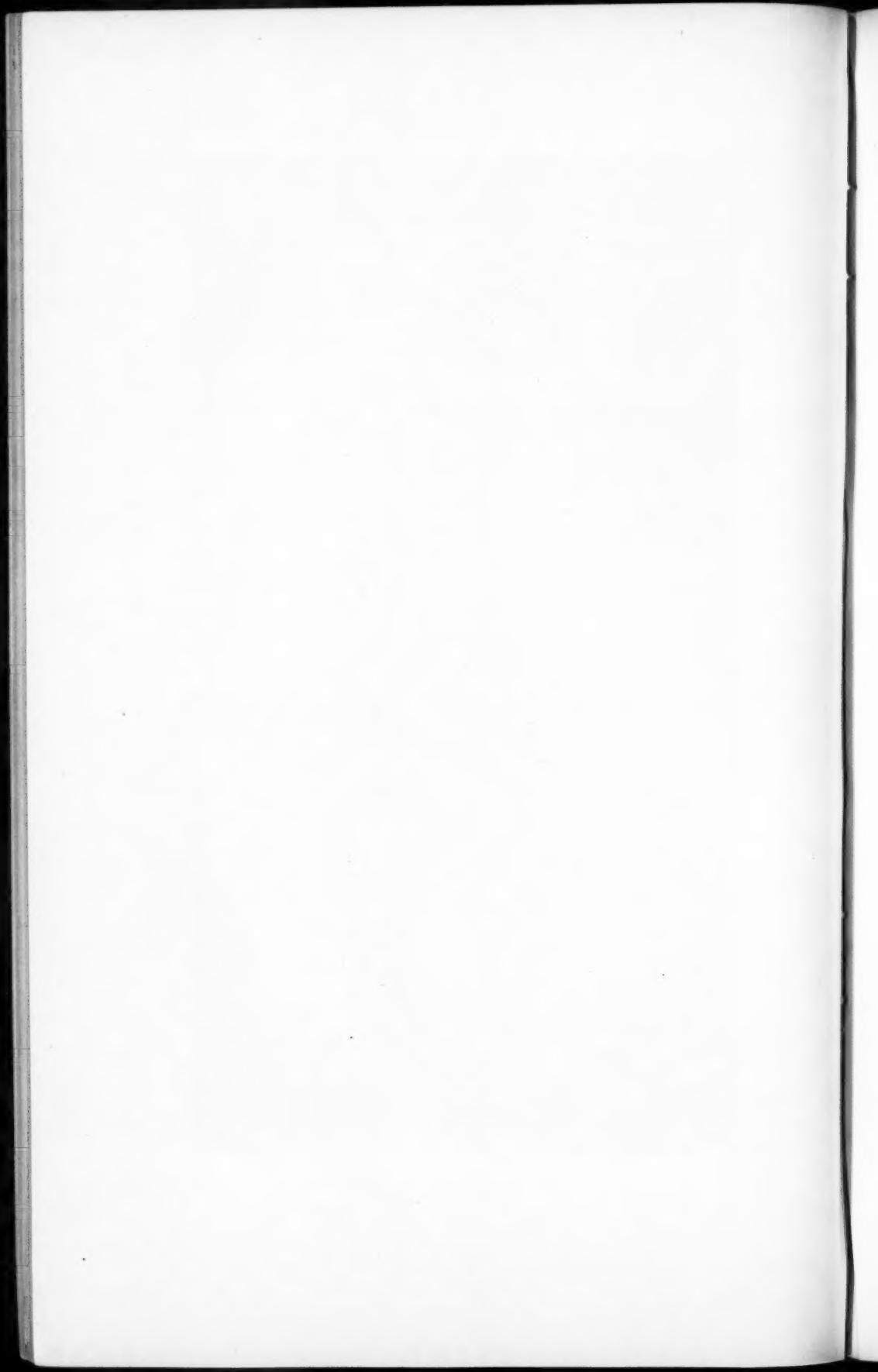
Present condition.—Fairly well nourished man, of good musculature, with conjunctivæ slightly yellow. Expression anxious and malar bones slightly prominent. Weight 175 lbs. Temperature 99° and pulse 70.

On examination, thoracic organs fairly normal, but abdomen presented a peculiar condition. It was enormously distended, with marked bulging of the flanks and over the inguinal region (Fig. 1). This distention is symmetrical, and abdominal walls move freely with respiration. The superficial epigastric veins

FIG. 1.



Showing general outlines of the abdominal distention.



on either side are markedly distended and run up to anastomose with the mammary veins.

On palpation, the walls are tense but there is no rigidity on deep pressure, except over the right upper quadrant where the resistance is definitely increased but no distinct mass can be felt; no tenderness, no fluctuation.

Percussion shows a marked dull note all over the anterior aspect of the abdomen except the epigastrium and flanks, where note is tympanitic. These dull and tympanitic areas are not affected by change of posture. Liver dulness begins at sixth rib in nipple line and is continuous below with dulness noted above. No change in spleen could be made out. Urine normal except trace of bile pigment. On June 25 an exploring needle was introduced into the dull area below the umbilicus and only about 1 c.c. of bloody serum could be obtained. This fluid showed microscopically numerous large round cells, several spindle-cells and numerous blood-cells. The temperature runs from $99\frac{1}{2}$ ° to normal, and pulse about 90.

[The above is an extract from Dr. Lafleur's clinical notes of the case. At this stage the patient was transferred to the surgical ward for exploratory laparotomy.]

Extract from Surgical Notes.—The following questions regarding the diagnosis suggested themselves to us for solution at the exploratory laparotomy: (1) diffuse tuberculous peritonitis; (2) cirrhosis of the liver, with ascites; (3) omental cysts (malignant?); (4) hydatid disease, and (5) mesenteric sarcoma.

We were rather inclined to regard the trouble as tubercular, and on June 27, under ether narcosis, which caused marked cyanosis, an exploratory incision was made in the median line below the umbilicus. On opening the peritoneum several small gelatinous cysts popped out, some of which were sent to the pathologist for examination. There was no free fluid. The tumor was seen to be chiefly in the great omentum which was adherent to the parietal peritoneum. Upon tearing through the omentum the mesentery was also seen to be involved. The whole omentum was filled with these cyst-like bodies, which appeared to be caught in a very vascular stroma.

This condition extended up to and obscured a good view of the liver. So dilated were the omental veins that we were afraid that undue handling might cause hemorrhage.

The picture was one of sarcoma, rapidly growing, in the omentum and mesentery. A piece of diseased omentum was tied off and removed, for examination, and the abdomen closed without drainage. His recovery from operation was uneventful and the patient left the hospital on July 18 in much the same physical condition, except somewhat weaker, than when he came in. Unfortunately, as is usual with sailors, we lost all trace of him.

CASE II.—(859 M., 1341 S., 1907, M. G. H. Reports.)—I am indebted to my medical colleague Dr. Finley for the clinical history of this case. W. R., aged 24, waiter, admitted to Ward H. on September 18, 1907, complaining of pain in the abdomen, diarrhoea, cough, and pain in the right side of the chest. Associated with these symptoms were night sweats, anorexia, progressive loss of weight and strength, dyspnoea and hiccough. His mother died from some tubercular trouble when he was four years old. The patient had been previously fairly healthy and only uses alcohol moderately.

Present illness.—Began eleven days prior to admission with severe diarrhoea, which has been fairly constant until two days ago when it became much worse, 9-15 stools per day. The faeces are liquid and dark green in color. Patent began to cough six days before he came to hospital. Very little expectoration until last night, when he expectorated some "black stuff" which suggested blood. Coincident with the beginning of the cough he felt abdominal pain, at first slight but daily becoming more severe. These pains are now lancinating in character and require morphia to procure sleep. He states that he had an attack of colic two months ago which lasted for three hours and was very severe. There was no recurrence until present illness. Since January, 1907 he has lost 39 pounds in weight and has had night sweats since September 1.

On admission.—Well-developed and fairly well-nourished man, with pale anxious face, covered with perspiration. No

anæmia of mucous membranes. Assumes any position in bed. Temperature subnormal, pulse 96; respirations 24.

Physical examination.—(a) *Thorax*: Dulness in both axillæ, otherwise resonant in front with normal breath sounds. Behind, marked dulness on right side below level of fifth spine. Absolutely flat note at base of right lung. Over upper part of this area, tactile fremitus and breath sounds are impaired, while at lower part both are quite absent. *Ægophony* at base. On the left side there is dulness, with diminished respiratory sounds. (b) *Abdomen*: Symmetrically distended, rigid, and markedly tender over hypogastric region. There is marked dulness everywhere, except over the stomach and down as far as the umbilicus. No fluctuation and no change in dull area by change in posture. Digital rectal examination is negative. Urine 1010, no casts, albumin or sugar.

In spite of rest, diet and treatment, the diarrhoea persists. On September 22 an aspirating needle was introduced into the right pleura and a large quantity of thin, purulent fluid removed, a smear of which shows numerous polynuclears but no organisms.

Next day I saw the case with Dr. Finley, and was struck with the similarity between it and the previous one. The patient was transferred to my ward for thoracotomy and exploratory laparotomy, which were proceeded with immediately. Upon opening the right pleural cavity posteriorly, about a quart of sero-sanguineous fluid gushed out. Both layers of pleuræ were greatly thickened and studded with rather firm nodules varying in size from a split pea to a bean. A tube was left in the thoracotomy wound through which considerable fluid continued to drain.

The abdomen was next opened in the median line below the umbilicus. In cutting through the abdominal wall numerous large veins were encountered, the operator remarking that they were suggestive of sarcoma. In the peritoneal cavity was a large quantity of fluid, similar to that which had just been evacuated from the right pleural sac. The parietal peritoneum was very thick, dark red in color, and studded with nodules similar to those in the pleura. The great omentum was seen to be enormously thickened and studded with dark, purplish nodules. A pathological examination of excised specimens showed a large round cell sarcoma.

The coils of intestine were much thickened and nodular, feeling like strands of rope, and were very adherent to one another. The mesenteric glands were very large and hard. The abdomen was hurriedly closed with through and through sutures, as the patient took the anæsthetic badly, and his pulse was very weak.

After operation the patient grew steadily worse, the temperature being mostly subnormal, and the pulse weak and rapid, until he died on the evening of the second day after operation.

EXCERPTS FROM AUTOPSY RECORD OF W. R. WITH PARTICULAR RELEVANCY TO THE DEGREE AND CHARACTER OF MAIN TUMOR AND ITS METASTASES. (SERVICE OF DR. ELDER.)

Peritoneal Cavity.—Upon opening the abdomen a moderate amount of salmon-colored, turbid, watery pus flows out. The omentum is large and covers the whole of the intestines, being wrapped into both loins and extending into the pelvis. It is much thickened in places, measuring about 1.5 cm. in thickness; this is due to numerous small nodules of soft, friable, greyish-pink material, some being distinct and others confluent. On section these nodules are homogeneous in appearance and soft. The borders of the omentum are especially filled with this tissue. The vessels are dilated. There are several dilated veins extending from the omentum across the transverse colon and gastrocolic omentum to the lower border of the stomach. The parietal peritoneum, in the neighborhood of the spleen, is thickened to about 1 cm., moderately firm, but friable. On section, this thickening is seen to be due to infiltration with a tumor mass similar to that found in the omentum. The parietal peritoneum in the pelvis, especially that lying between the bladder and rectum, is similarly infiltrated. The *Mesenteric Lymph Nodes* are enlarged, the largest being about the size of pigeons' eggs. The whole mesentery, too, is thickened to about 1 cm. The surface of the mesentery contains purplish blotches. On section the enlarged glands and mesenteric tissue are seen to consist almost entirely of homogeneous, greyish-pink, soft, moderately friable tissue similar to that seen elsewhere. In certain areas there is definite evidence of a hemorrhagic condition. Covering the whole of the large bowel and looking like large appendices epiploicæ are numerous areas measuring from 2 to

4 cm. in length, made up of similar tissue to that described above; some on section are very hemorrhagic. In places the tumor has infiltrated the intestinal wall. There is an area in the ileum about 60 cm. from the ileo-caecal valve which is completely infiltrated by the tumor. This surface appears nodular and mottled. Upon opening, the mucosa shows a small area 3 by 2 cm. of tissue denuded of mucosa, hyperemic in appearance, though smooth. The intestinal wall is about 1 cm. in thickness.

The glands about the lesser curvature of the stomach and the head of the pancreas are markedly enlarged. The retroperitoneal and pelvic glands are enlarged and soft. There are numerous polypi of tumor tissue upon the under surface of the liver and over the spleen. The *Appendix* is very much thickened, measuring 8 cm. in length and 2 cm. in thickness. The meso-appendix is similarly involved. *Diaphragm*: left fifth space, right fourth space.

Pleural Cavities.—The right cavity contains a small amount of pus. The parietal and visceral pleuræ are covered with a thick, yellowish, plastic exudate. The pleura is injected. The diaphragm is thickened, being mottled in appearance and infiltrated with new growth. It measures 1.2 cm. in thickness. The upper surface contains numerous heaped up masses of similar tumor tissue. The left pleura shows a profuse covering of both parietal and visceral pleuræ, with raised, flattened discs of tumor mass. The diaphragm is involved in a manner similar to that on the right side.

Pericardial Cavity.—Between the pericardium and the sternum there are masses of tumor. The heart shows on its anterior aspect numerous small areas of whitish thickened epicardium. There is a normal amount of straw colored fluid.

Spleen.—Also shows two or three small areas of tumor tissue on the upper surface. On section the spleen is pale. The Malpighian bodies are large and numerous. An increased amount of pulp comes away on scraping.

Pancreas.—Normal in color and consistence, covered with tumor-glands and thickened peritoneum.

The thoracic duct, especially in the abdomen, together with the lymphatics leading into it, is thickened and its lumen is obliterated by tumor tissue.

Liver.—Weight, 2045 Gm. Normal in consistence, some-

what pale in color and soft. The upper surface is adherent to the diaphragm and infiltrated by tumors. Along the outer border and outer surface of the left lobe are numerous tags of pale yellowish-pink, very soft tissue adherent to the peritoneum but easily brushed off. On section the liver is pale, with lobules indistinct, and friable.

Kidneys.—Normal except that in the kidney substance there are several small nodules measuring 3 mm. in diameter, of greyish, moderately firm, semi-translucent tissue.

Anatomical Diagnosis.—General sarcomatosis of the omentum, glands of the mesentery, retroperitoneal and pelvic glands, bronchial glands, peritoneum, large and small intestines, diaphragm and pleurae, pancreas and thoracic duct. Acute diffusent peritonitis. Acute pleuritis with empyema. Septicæmia (streptococci infection.) Ascites. Fatty liver. Perihepatitis. Perisplenitis.

MICROSCOPICAL EXAMINATION.

Omentum.—The omental tissue is everywhere infiltrated with small round cells with large spherical nuclei which are granular in appearance, the cells having but little protoplasm. Large numbers of these cells are in mytosis. There is very little intercellular substance, only here and there do the cellular masses present connective tissue trabeculae. In some of the less dense areas there still remain isolated clusters of omental fat as indicated by large spaces. In areas that are only sparsely invaded the above described cells follow along in irregular columns between the fat cells. In places there are areas which show enormous vascularity, many vessels are new. At one side of the section there is considerable fibrous tissue and smooth muscle. The muscle is everywhere infiltrated with the above described lymphoid cells. In what appears to be the zone between the muscle and the fat tissue is a fairly dense layer of fibrin.

Intestine.—The mucosa over part of the section is absent, the exposed submucosa is covered with a layer of necrotic cells as evidenced by their taking the red stain and showing no nuclei. The submucosa and the muscle layer are infiltrated by large numbers of cells similar to those described above in the omentum. The normal appearance of the submucosa and muscularis is completely lost; here and there are isolated islands of circular muscle and often in the same field similar islands of

longitudinal muscle. The submucosa is densely packed with tumor cells, more so than any other layer of the gut. There is also a band of similar cells lying beneath the serosa and between it and the outer muscle layer. Upon the surface of the serosa there is a collection of loose tissue made up of similar cells and a small amount of fibrous tissue; apparently this condition is due to the infiltration of old adhesions.

Diaphragm.—The muscle fibres present are for the most part cut longitudinally; striations are well marked. The individual fibres are widely separated by masses of tumor cells which extend in long solid columns between the muscle fibres. These cells make up the greater part of the section. At the edges of the section the tumor elements are more densely aggregated than those that have infiltrated the muscle.

Pancreas.—The alveolar tissue about the organ is composed almost entirely of tumor cells. In places these project down into the substance of the pancreas, for the most part following the trabeculæ, though there are places where they break through the connective tissue capsule of the lobes and scatter all through the acini.

[For the foregoing report, the author wishes to thank Dr. C. W. Duval, the hospital pathologist, and Dr. F. D. Gurd, his assistant.]

As was hinted in the beginning of this paper, I was astonished in looking through such surgical works of reference as were at my command, to find so little written upon this subject. Most writers do not mention the subject at all, while others say that while the condition might occur it must be extremely rare. In Sajous' "Analytical Cyclopædia of Practical Medicine" (1901), vol. v., p. 436, I found the best reference: "Sarcoma of the mesentery is of rapid growth and almost always ends fatally. Ascites is usually present. There is rapid involvement of surrounding structures, making removal impossible." A review of the literature from 1896 to 1900 follows, which shows that out of 57 cases of solid tumors of the mesentery reported, 11 were sarcoma. One case, that of a physician, is reported, in which a diagnosis of cirrhotic liver was made, based upon ascites and inability to

palpate the liver or outline it by percussion. Necropsy showed a tumor involving the mesentery and adjacent glands, with numerous metastases in the pancreas, greater and lesser omentum, pleura, bronchial and inguinal glands. Microscopically it proved to be lymphosarcoma of the mesentery.

The clinical pictures presented by our two cases varied considerably, as a reference to the histories will show. Yet both suggested tubercular peritonitis in some of its varied forms. The second case was particularly suggestive of rapid, miliary tuberculosis of the serous sacs (peritoneum and pleuræ), while Case I. rather pointed to the chronic form of tubercular disease of the peritoneum, where there is present great thickening of the omentum with little or no fluid. It is greatly to be questioned if some cases, at least, of peritonitis attributed to tubercular infection, and in which no exploratory operation or post-mortem examination has been made, may not have been really cases of sarcoma of the peritoneum.

I do not think that clinically we are yet in a position to make other than a tentative diagnosis in these cases, which diagnosis must be confirmed either by post-mortem findings or ante-mortem specimens subjected to microscopical examination.

GUNSHOT WOUND OF ABDOMEN INVOLVING THE STOMACH AND JEJUNUM, COMPLICATED WITH PREGNANCY.

BY H. M. LEE, M.D.,

OF NEW LONDON, CONN.

CASE RECORD.—White, female, 23 years of age; married, mother of one child; housewife by occupation. Was admitted to the hospital in the forenoon of January 26, 1907, with a gunshot wound in epigastrium, $\frac{1}{2}$ inch from middle line on right side and $2\frac{1}{2}$ inches downward from the ensiform cartilage, and gunshot wound in right hand between the second and third metacarpal bones. On admission, pulse, 120; temperature, 100° ; respiration, 28.

History of Present Illness.—While standing in her room with a child in her arms, she was shot and wounded as above described, at 6.00 P.M., the day before admission to the hospital.

Examination at the time revealed a bullet wound penetrating the abdominal cavity in a direction slightly upwards and towards the right. From the wound a serous fluid and gas escaped on pressure being applied. The abdomen distended markedly, with evidence of gas in the abdominal cavity. The uterus was enlarged and the patient seven months pregnant. Placental bruit and foetal heart distinctly heard. The quickened respiration, rapid pulse, tenderness, rigidity and pain over the entire abdomen, the temperature and facial aspect determined accurately that a sharp peritonitis was in progress, and an immediate operation was undertaken under ether anaesthesia. An incision was made into the abdomen, just to the right of the midline, extending from a point a little below the ensiform cartilage downward to the umbilicus.

Upon opening the abdominal cavity, the parietal peritoneum in the region of the wound and the visceral peritoneum were injected and covered here and there with pus. In the anterior wall of the stomach, $\frac{1}{2}$ inch above the inferior border, was a large ragged opening extending through all the coats of the stomach, 3 inches long, running upwards toward the pylorus. The mucous membrane on the posterior surface opposite this wound, and in a space covering almost the entire pyloric area, was injected, and

at the centre of this injected area, a large mass of contused tissue appeared. The stomach contents, pus, serum and blood, filled the cavity of the abdomen. At a point in the jejunum, about 14 inches from the fossæ of Treitz, were three punctured wounds, irregular and ragged in outline, penetrating the coats of the gut. Two were in the anterior aspect of the gut, 1 inch apart, and the third in apparently another coil at the upper border of the gut 14 inches lower down the tract. This coil of intestines was glued together by adhesions and much pus and intestinal contents noted in and around the points of injury, and on every hand evidence of peritonitis.

Procedure.—The detritus found in the cavity was washed out by saline solution—the intestines thoroughly washed and searched for injury. The wound in the stomach was treated by a free incision well beyond the bruised area, in order to get healthy tissue to approximate, and the wound united by continuous sutures through the muscular and submucous coats, a layer of Czerny-Lembert sutures, reinforced by Halsted's sutures, completed the union of the rest of the wound. The wounds in the gut were closed by Lembert sutures.

The contused area spoken of in the posterior wall of the stomach was cleared away by cutting out mucous membrane and part of the muscle wall of the stomach and the edges brought together by continuous submucous sutures. The patient was but a short time under the ether and stood the operation well. Intravenous saline 1000 c.c. given during the operation and a large amount of saline solution was left in the cavity. The bullet was not found. The incision was closed in layer, with a cigarette drain down to wound in stomach.

The patient made an uneventful recovery. The only treatment being thirty-six hours of slow rectal irrigations and morphia, to prevent possible uterine contractions.

The patient left the hospital on February 15. Came back two weeks later to arrange for her delivery there and was then well. Was in due time delivered of a healthy child and to-day is as well as ever.

APPENDICITIS AND TETANY.

BY CHARLES H. GOODRICH, M.D.,

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Attending Surgeon to the Methodist Episcopal Hospital and to the
Brooklyn Orphan Asylum.

ON Tuesday, June 23, 1908, a young woman, 19 years old, was referred to my service at the Methodist Episcopal Hospital by her physician, Dr. E. J. Kenny. She had been in excellent health until the midnight immediately preceding her admission. During the evening she had devoured a vicious mixture of foods including clams, soft shell crabs, ice-cream, and peanuts. She retired about eleven o'clock and one hour later was seized with violent pain in the right iliac region which rapidly extended over the entire lower abdomen. Vomiting was repeated several times during the night, affording no relief for the pain. Dr. Kenny saw her in the early morning, administered a mixture containing one grain of opium and ordered an enema which was effectual. When he saw her at 1 P.M. he made the diagnosis of acute appendicitis from tenderness over the right iliac region (not definitely localized), the temperature 102° F. and the pulse 92. He referred her to me as a very acute case and the ambulance was dispatched for her promptly. Upon the arrival of the ambulance surgeon at 2.15 P.M. she complained of pains in her hands and feet, and her thumbs were tonically opposed to the palms. Any passive motion of thumbs was accompanied by great pain. The slightly extended feet were exquisitely sensitive on flexion. The jolting of the ambulance gave her great pain in the extremities which attracted her attention at this time more than any abdominal discomfort. Upon her arrival at the hospital she was examined by the House-Surgeon, Dr. F. P. Keil, who at once made a diagnosis of gastro-intestinal tetany, reporting this and a leucocyte count of 23,250, with 78 per cent. polymorphonuclear leucocytes at 3 P.M. I saw the patient at 3.30 P.M. when she presented the typical picture of gastro-intestinal tetany. Her temperature had risen to 103.4°, pulse 98. The chest was negative. The abdomen was generally tender over its lower half, with somewhat exaggerated tenderness

over the centre of the right iliac region. I found the right rectus very slightly rigid, although this opinion was dissented from by Drs. Keil and Kenny and my assistant, Dr. Durham.

As abdominal pain and tenderness are usual in gastro-intestinal tetany, and as the typical signs of appendicitis were not especially marked it became a question whether or not abdominal section should be undertaken. The leucocytosis was cited as a reason for exploration. Thereupon it was recalled that such a blood phenomenon might be possible with gastro-intestinal toxæmia so profound as to cause tetany, although the literature has thus far been silent on this point.

The abdomen was opened through the right rectus incision. The examining finger found a thickened appendix hanging over the pelvic brim. After enlarging the peritoneal incision it was delivered,—distorted, greenish, succulent from base to tip. It was typically removed, the base being cauterized with carbolic acid and inverted through a purse-string of catgut. The stump of the meso-appendix was sutured as a fortifying pad over the remaining dimple, the suture being introduced distally to the ligature previously applied to the meso-appendix. This method long ago suggested and for some years practised by the writer, not only strengthens the intestinal wall and inverts the raw, cut surface of the meso-appendix, but also avoids the possibility of traction releasing the original ligature. One case of secondary hemorrhage has come under our observation where the suture and the meso-appendix ligature were tied together after the manner largely used.

Upon cross section the appendix was found to have gangrenous mucosa, and necrosing muscularis and serosa. It was filled with liquid faeces and pus.

The microscopic picture as reported by Dr. Dexter, Pathologist, is as follows: "Round cells of inflammation, isolated and partly broken down connective-tissue cells, adipose, and blood cells are in various stages of disintegration. Portions of blood-vessel walls and much detritus can be made out. Relations of the various tunics of the appendix and relations of the morphological elements to one another are almost entirely destroyed."

The patient has made an uneventful recovery, the temperature touching normal on the day following that of operation.

The wound healed per primam. The symptoms of tetany gradually disappeared during the night succeeding the day of operation and did not recur. As no effort to evacuate her bowels was made until the third day, the presumption that the destructive inflammation of the appendix caused the symptoms of tetany seems reasonable.

HARRINGTON'S OPERATION OF INTRAPERITONEAL CYSTOTOMY,

WITH REPORT OF FOUR CASES.

BY CHARLES L. SCUDDER, M.D.,

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AND

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Surgeon to Out-Patients at the Massachusetts General Hospital.

ON June 10, 1893, before the Obstetrical Society of Boston, Mass., Dr. F. B. Harrington read a paper entitled "On the Feasibility of Intraperitoneal Cystotomy, with the report of a case." This paper was subsequently printed in the *ANNALS OF SURGERY* in October, 1893,—fifteen years ago.

Harrington in this paper states that after "repeated trials upon the cadaver it has been found that the bladder may be sewed up intraabdominally so that it resists much distention both by water and air." Harrington cites the accidental incision of the bladder during laparotomy with subsequent safe suturing; the successful treatment by suture of the bladder for penetrating wounds; the safe suture of the stomach, gall-bladder, and intestine. He then asks very pertinently, "why then should the bladder not be approached by the route which affords the greatest facilities?" Harrington further says, "with proper care it is probable that the bladder can be as certainly shut off as the stomach or intestines. The flow of urine through the ureters is, as a rule, by drops, and can be easily taken care of by an assistant with sponges."

Again, "intraperitoneal cystotomy may be performed for tumors of the bladder, for enlarged prostate, for disease of the ureters, for cases of stone in the bladder of great size, and for sacculated stone. There are advantages in the operation which

certainly, at times, render it preferable to suprapubic cystotomy." Harrington then describes the steps of the operation in great detail,—the walling off of the intestine, the opening of the bladder, the control of hemorrhage within the bladder, the closure of the bladder wound, the complete closure of the abdominal wound. He then says, "the intraperitoneal operation does not interfere with suprapubic drainage, should drainage be necessary. As a rule, however, drainage will not be necessary, except that which can be obtained by the urethra."

Then follows the report of an intractable case of hemorrhagic cystitis for which much had been attempted with little success. Harrington decided that by means of an intraperitoneal cystotomy he could inspect and treat the interior of the bladder most advantageously. He operated by this method, curetted certain areas of the bladder mucosa, excised other areas to sound tissue; closed the bladder tight by suture; closed the abdominal wound tight by suture and drained the bladder. The subsequent history shows that the woman was practically cured of her difficulty.

The conception of the operation of intraperitoneal cystotomy, the experimental work upon the cadaver to place the operation upon a sound physical basis, the demonstration upon man that it is a safe and satisfactory procedure, the advocacy in 1893 of this operation in the *ANNALS OF SURGERY* as a new and tried operative procedure, subsequent operations for tumor of the bladder done by Harrington as yet unpublished,—these facts establish intraperitoneal cystotomy as a definite and original surgical operation. This has been the work of Harrington. The procedure, for whatever cause undertaken, should very properly be known as Harrington's operation of intraperitoneal cystotomy. We have been unable with the literature at our disposal,—and a careful search has been made,—to discover any similar systematic and constructive work done at an earlier time by any other surgeon. The recent report of Dr. Charles Mayo in the *ANNALS OF SURGERY* for July, 1908, serves as valuable independent evidence in favor of this established operation of Harrington.

The writers, working in the same surgical clinic with Harrington, wish to report here four cases of intraperitoneal cystotomy. They are indebted to Dr. Harrington for suggestions and encouragement in connection with these cases.

CASE I.—W. T. (No. 157,342), male, 42 years old, married, a glass packer, was admitted to the Massachusetts General Hospital on Dr. Mixter's service, on March 6, 1908, recommended by Dr. John E. Somers, of Cambridge, and was kindly transferred to the writer for treatment.

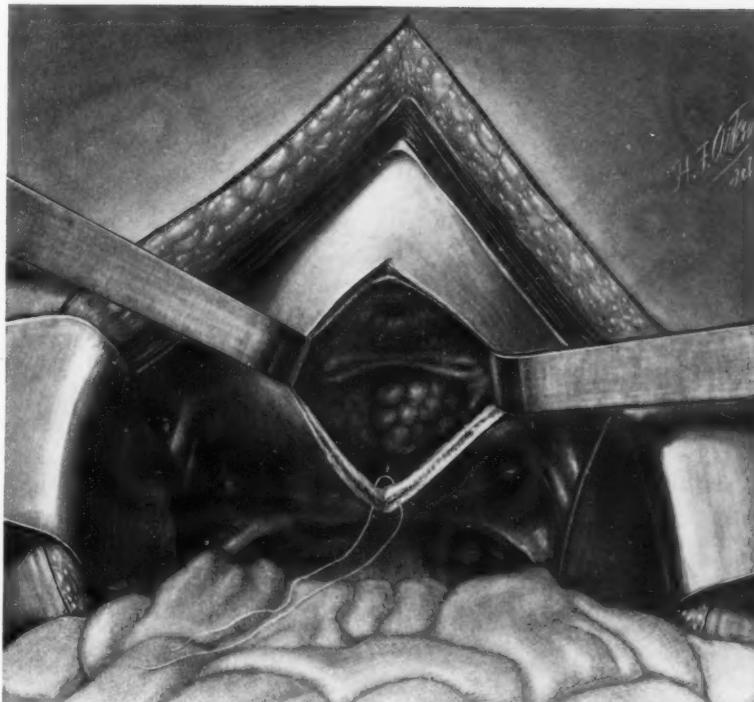
The family history and previous history are unimportant. Six months ago first noticed that the urine was bloody. There was no pain at this time, and the blood soon disappeared. Six weeks ago the urine again became bloody, but cleared up in two days. Patient stayed in bed ten days, and then returned to work. Then began to have increasing frequency of micturition accompanied by pain; finally requiring catheterization twice daily.

Examination showed a well-developed and well-nourished man of striking pallor. Chest and abdomen negative. External genitalia normal. By rectum prostate felt to be symmetrically enlarged and very hard. Urine contained blood, with small amount of pus and bladder epithelium.

Cystoscopic examination of March 9, 1908, is recorded as follows: "Cystoscopy shows a partly villous and partly smooth rounded tumor, size of a small egg, intimately connected with prostate and hanging down from above the internal urethral orifice: its base cannot be seen. Floor of the bladder inflamed with a few small calcareous deposits. Ureteral openings normal. Cystoscopic diagnosis: tumor of bladder, probably malignant."

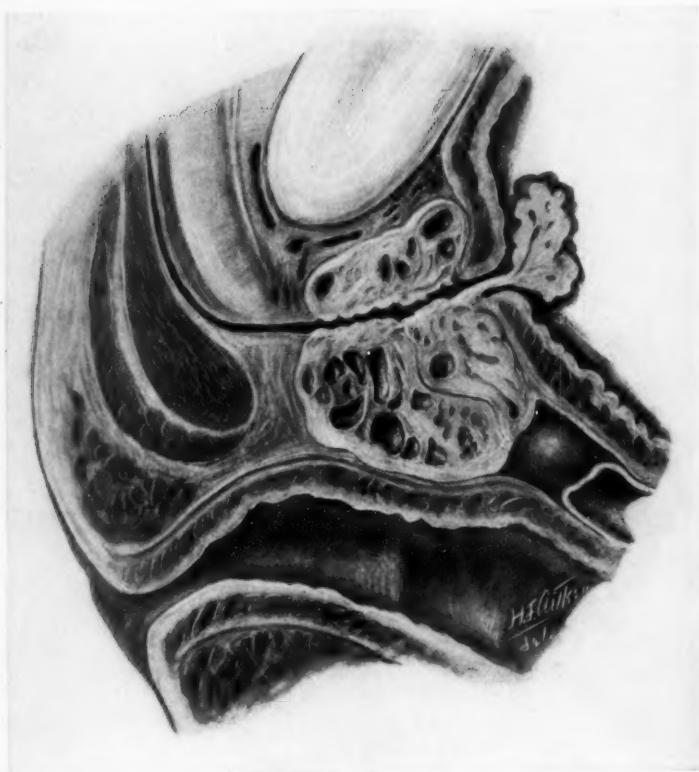
March 13. Operation (L. D.): Bladder washed out and filled with boric acid solution. Usual suprapubic cystotomy incision. A lobulated tumor arising from close to the internal urethral orifice could be felt. On account of the limitation of the cystotomy incision, it was difficult to make out the character and attachments of the tumor. The bladder was therefore dried and packed with gauze, and the abdominal wall incised upwards for about three inches, opening the peritoneal cavity; the intestines were walled off with a gauze pack, and the original cystotomy incision extended backwards in the median line for about two and one-half inches (Fig. 1). This gave a splendid approach to

FIG. 2.



Illustrating Harrington's intraperitoneal cystotomy for new growth of the urinary bladder. Note long abdominal incision well retracted with broad retractors; intestinal coils completely concealed and protected by gauze; low posterior incision into bladder held open with narrow retractors; an anterior retractor in the bladder is often helpful; internal meatus; ureteral orifices; tumor; traction suture; deep pelvic folds, large iliac vessels, rectum.

FIG. 2.



CASE I. Semi-diagrammatic drawing of median section of pelvis, showing cystic prostate, with reconstruction of bladder tumor arising by a pedicle from within the prostatic urethra.

the tumor, and it was then seen to be pedunculated with the pedicle actually arising from within the prostatic urethra (Fig. 2). The

FIG. 3.

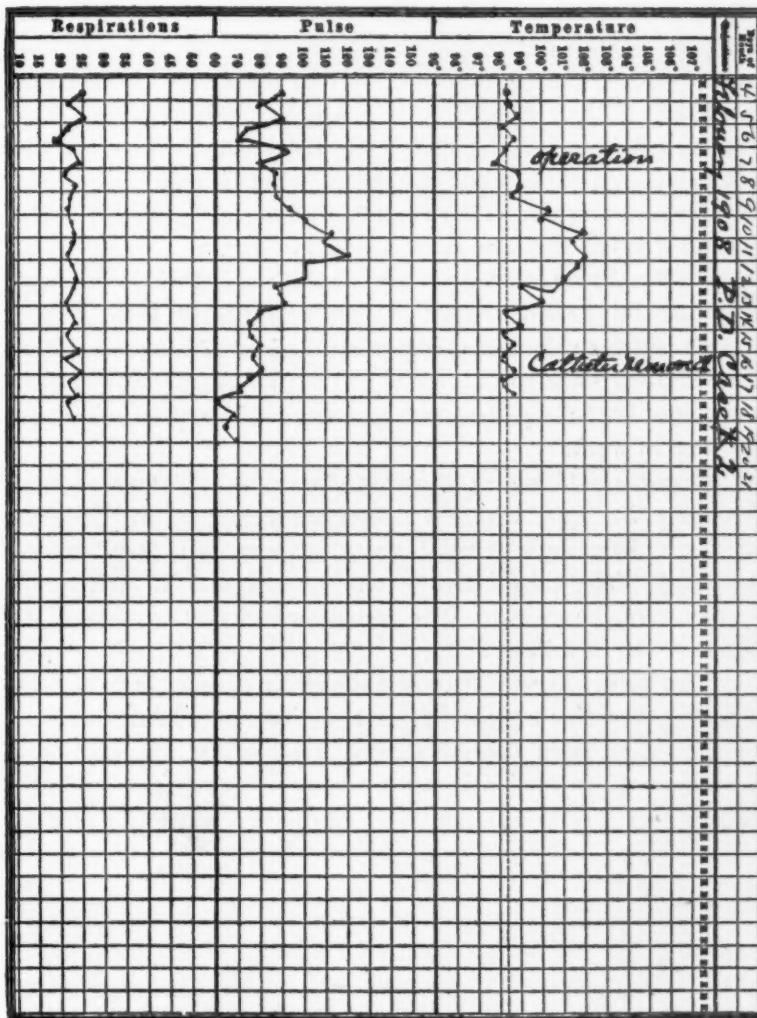


Chart of temperature, pulse, and respiration of Case 1 just before and following operation.

pedicle was clamped and the tumor removed with scissors. A median one-inch incision was then made into the prostate just

below the urethral orifice, and the entire prostate gland was readily enucleated in one piece, including the prostatic urethra. The wound was packed with gauze, and the posterior portion of the bladder incision closed with two layers of catgut sutures. Walling off sponges removed and peritoneal cavity closed. Bladder was then washed out and closed about a drainage tube and one gauze wick, which led to the cavity from which the prostate was enucleated. There was very little postoperative bleeding. The wick was removed on the third day and the tube in one week, when catheter drainage through the urethra was instituted. Convalescence was uneventful except for an attack of epididymitis. Clinical chart of this case is reproduced in Fig. 3.

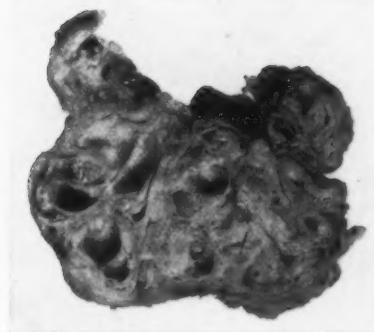
On April 16, 1908, the patient left the hospital with the suprapubic wound healed solidly. Urine was voided through the urethra without pain, but at somewhat diminished intervals. The urine showed some turbidity due to pus; no blood. When seen one month later the patient was free from all symptoms and had returned to work.

Remarks.—This case illustrates the value of intraperitoneal cystotomy for approaching a deep-lying tumor of the bladder, which may be quite inaccessible through the usual extraperitoneal cystotomy. The chief interest in the case, however, attaches to the nature of the growth. The pathological report by Dr. W. F. Whitney was as follows:

“An elevated growth of the bladder-wall near the opening of the urethra about 3 cm. in greatest diameter. With this was the prostatic gland, the outer portion of which was torn and lacerated, and on section it was found to be honey-combed with relatively large cysts between which there were very thin partition walls (Fig. 4). Some of the cysts were filled with a little parenchymatous tissue.

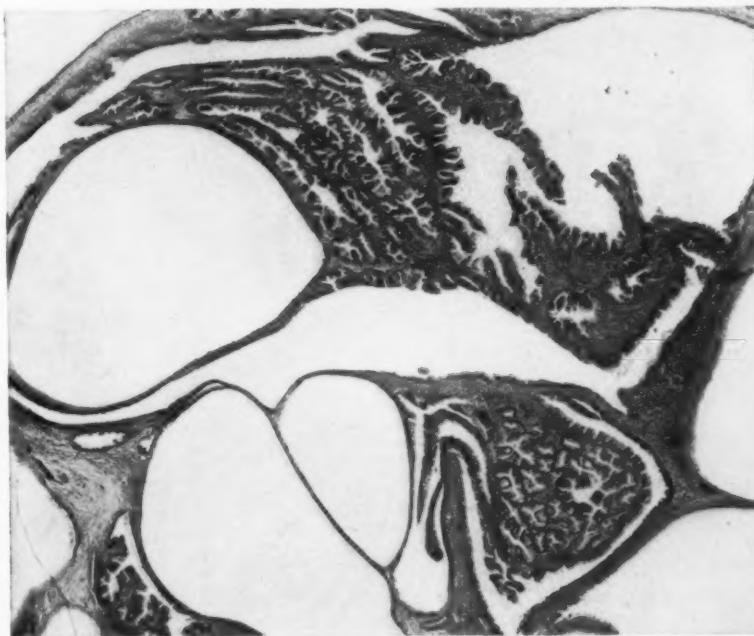
“Microscopical examination of the prostate showed the cyst cavities to be lined with a flattened epithelium in places, and in others the epithelium was longer, and more cylindrical. The parenchymatous portions presented a papillary growth from the surface of the cysts which almost completely filled the cavities (Fig. 5). The tumor from the bladder (Fig. 6) was covered on the surface with epithelium, beneath this was a growth of glandular tissue in general appearance similar to that of the papillary

FIG. 4



CASE I. Photograph of median section of prostate showing cystic condition. Actual size.

FIG. 5.



CASE I. Section of prostate showing the papillary epithelial ingrowths into some of the cyst cavities.

FIG. 6.



CASE I. Section of tumor which projected into bladder showing the same process to a less marked degree.

growth in the prostate, and in this tumor there also were a few small cysts.

Diagnosis.—Papillary cyst-adenoma of the prostate, with extension into the bladder-wall."

Dr. Hugh Young, in his accurate study of the pathology of prostatic hypertrophy,* in describing the glandular or adenomatous form, speaks of the dilatation of the acini, with papillary projection of epithelium which often occurs, and pictures some illustrative cases. The above case is the most extreme example of this process which I have seen hitherto reported and is sufficient, I think, to warrant the name of papillary cyst-adenoma. The condition simulates exactly the tumor of the same name which is of quite frequent occurrence in the female breast.

CASE II.—P. D. (M. G. H., No. 156,894, Feb. 4, 1908). A man 39 years old, married, bartender. He is large and stout and has always been well. He has passed dark blood with clots painlessly for ten days. The urine has been clear for the four days just previous to entering the hospital. Dr. Chute, upon cystoscopy, discovered a papilloma of the bladder.

Cystoscopy by Dr. Davis, at the hospital: Bladder holds six ounces without discomfort. Just above the left ureteral orifice and close to it there is a pinkish papillary tumor about the size of a silver quarter. Remaining bladder-wall appears normal. Both ureteral openings normal in appearance and functionate naturally. The tumor lies so close to the left ureteral orifice that when the urinary stream is emitted the villous processes of the tumor are set in motion.

Diagnosis.—Single, pedunculated, lobulated papilloma of the bladder.

Operation by C. L. S., February 7, 1908: Intraperitoneal cystotomy; removal of growth; closure of bladder and abdominal wall; drainage of bladder by No. 12 soft rubber catheter. Bladder drainage was discontinued February 16, that is, nine days following the operation. There was a slight amount of bleeding following the operation which lasted, evidenced by a slight reddish tinge in the urine, until February 22, that is, for fifteen days following the operation. He sat up February 28. March 1 he was discharged from the hospital. The urine at that time was

* Johns Hopkins Hospital Reports, xiv, 128.

slightly turbid, with considerable pus; the cloudiness was lessening daily. The abdominal wound was solid. There was no frequency of micturition and no blood.

Pathological Report by Dr. Whitney, February 7, 1908 (82-15).—"A soft papillary growth, many of the filaments being 1 cm. in length. Microscopical examination showed fine vascular and fibrous stalks covered with a thickened layer of epithelial cells. As far as could be determined there was no infiltration of the deeper tissues.

"*Diagnosis*.—Villous papilloma."

August 1, 1908, six months after the operation, the patient writes, "I am working every day, averaging about sixty hours a week. There is no blood in my urine and I have very little trouble with my bladder. My bladder is all right."

CASE III.—R. G. M. (M. G. H., No. 157,169, February 24, 1908). A man 41 years old. Has always had good health. He first had haematuria one and a half years ago. One year ago an appendectomy was done for acute appendicitis. Since the appendectomy he has had no haematuria until two weeks ago. For the past five days the urine has not been free from blood. There is slight frequency of micturition.

Cystoscopy by Dr. Davis at the hospital: Bladder holds six ounces. Washes clear. No bleeding. On the right lateral wall of bladder, overhanging and external to the right ureteral ridge, is a lobulated papillary tumor of pinkish color with numerous shreds of fibrin attached. The urinary jet sets the tumor in motion. Whole tumor is seen to pulsate markedly. Left ureteral orifice normal. Bladder-wall generally injected but otherwise normal. No other tumor seen.

Diagnosis.—Papilloma of bladder.

A transperitoneal cystotomy was done February 28, 1908, by L. D. and C. L. S., the tumor removed and the base of the tumor thoroughly cauterized. The patient was discharged from the hospital March 17, 1908. Cystoscopy, before he was discharged from the hospital, showed a linear scar, healed perfectly, in line of bladder incision. A depression at the site of tumor. The right ureteral orifice was clear. A small loose ligature or suture was seen in one edge of the site of operation.

Pathological Report (82-74) by Dr. Whitney.—"A papillary growth measuring about 2.75 cm. in greatest diameter with a

broad base and long vascular stalks extending from the surface. On microscopical examination thin stalks of fibrous tissue containing large blood-vessels were found covered with several layers of columnar epithelium. As well as can be determined there was no infiltration of the base.

“Diagnosis.—Papilloma, probably malignant.”

A letter from the patient dated July 24, 1908, that is, five months after operation, states that he is perfectly well. There is no longer any blood in the urine. He has no pain, and is doing his regular work.

CASE IV.—A. J. (M. G. H., No. 157,973, O. P. D., No. 104,806, April 17, 1908). A man 33 years old, married. Patient sent from the out-patient department by Dr. J. M. Jackson. He has always been well. For the past seven months the urine has been bloody. Four months ago he first had pain on micturition. The haematuria was intermittent, at first every two weeks, then every week, then every three days. He has lost ten pounds in weight during the past seven months. A well developed man. Nothing remarkable in his physical examination. Urethral discharge purulent.

Cystoscopy by Dr. Davis at the hospital: Difficult because of persistent bleeding from the bladder. Surrounding the internal meatus is a shaggy, ulcerated and partly necrotic mass, beyond which a moderately inflamed bladder-wall may be seen. The cystoscopic picture suggests strongly an ulcerated, malignant growth. Rectal examination does not confirm this cystoscopic diagnosis.

April 28, operation by C. L. S. Transperitoneal cystotomy. Excision of tumor, curettage and cauterization of the base of tumor. Suprapubic drainage of bladder. Abdominal peritoneal wound closed completely. Bladder washed every hour for first twelve hours. May 6, or eight days after operation, the urine was clear and contained no blood microscopically. Ten days after operation sitting up in bed, May 25, discharged from the hospital to the doctor at home and to the out-patient department.

Urine examination, April 18: Normal, acid, 1016, slight trace of albumin, sugar absent, pus, blood and a few squamous cells are present.

Pathological Report by Dr. Whitney, April 28, 1908 (84-92).—“The tumor was a soft, solid papillary growth 4 cm. in

diameter, more or less lacerated. Microscopical examination showed infolded masses of large epithelial cells separated by vascular bands of fibrous tissue.

“Diagnosis.—Malignant papilloma.”

A report from the patient August 1, 1908, three months and a half after operation, said that he was “feeling well.”

Remarks.—The ordinary suprapubic approach to the interior of the urinary bladder is often unsatisfactory. Unsatisfactory because the interior of the bladder is inaccessible, hemorrhage is not readily controlled. The most striking fact about the Harrington operation, is the remarkably easy access to the interior of the bladder, especially to the base and posterior surfaces. These are the parts most often requiring operation. Not only is the access to the bladder rendered easy but manipulation of instruments within the bladder is unobstructed by this approach.

The abdominal incision should be a long one, from the symphysis to the umbilicus. If the abdominal wall is thin a shorter incision will be needed than if the abdominal wall is thick, because of fat and muscle. The place of the incision in the bladder will be determined largely by the situation of the growth to be removed. Most growths lie low in the bladder. Ordinarily, therefore, it will be best to incise the bladder not high up but low down toward the rectal wall. The tendency is to open the bladder too near the peritoneal attachment. If this is unwise done it will be found that in order to get to the base of the bladder an unnecessarily long posterior incision in the bladder-wall will be required. The opening of the bladder posteriorly and low affords satisfactory access to the field of operation.

A temporary suture of linen or catgut, placed immediately upon opening the bladder, as shown in the drawing (Fig. 1), through all the coats of the bladder-wall at the most inferior angle of the bladder wound, will serve as a tractor of considerable assistance in steadyng the bladder, and it will mark the situation for the lowermost sutures to close the bladder wound.

The method of closure of the bladder wound in all cases here recorded was in layers. Catgut being used for the mucous membrane and muscular layers and linen for the peritoneal layer. Continuous sutures in each instance were used. The peritoneal continuous suture was reinforced by several interrupted peritoneal linen stitches.

All bleeding from the seat of operation within the bladder should be checked before closing the bladder. The ordinary method of control of hemorrhage by suture ligature, simple ligature and by actual cautery may be employed.

Postoperative drainage of the bladder was used in each of these cases; by the urethral catheter in three cases, by suprapubic drainage in two cases. The postoperative urethral catheter drainage is not always necessary. It may be positively indicated by a continuous oozing of blood. Frequent irrigation of the bladder without urethral drainage may suffice to get rid of accumulated blood.

One of these cases illustrates the use of the intraperitoneal cystotomy after exploratory extraperitoneal suprapubic cystotomy had shown the inaccessibility of the growth. This same case illustrates the ease and safety of suprapubic drainage following intraperitoneal cystotomy.

The intraperitoneal cystotomy of Harrington is not here advocated as a routine procedure for all urinary bladder growths, but for those which are inaccessible by the usual routes, and for those which require removal of the whole thickness of the bladder-wall in any part.

SIMULTANEOUS LIGATION OF BOTH EXTERNAL
ILIAC ARTERIES FOR SECONDARY HEMOR-
RHAGE FOLLOWING BILATERAL URETERO-
LITHOTOMY.*

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THE case I am about to report presents so many points of unique interest, that I have deemed it of sufficient importance to place on record.

S. W., aet. 36, Austrian, was referred to me in March, 1907, by Dr. B. Lefkovics, with the diagnosis of nephrolithiasis. I shall introduce only the important data in outlining the history of the case. Ten years ago he was seized with an attack of sudden left-sided abdominal pain, followed by vomiting; at the time this attack was diagnosticated as appendicitis. These attacks recurred at intervals of about two years. About two and one-half years ago similar attacks began also upon the right side, and attacks upon both sides of the abdomen have recurred at varying intervals up to the present. The later attacks are described by the patient as beginning in the back and radiating toward the front, to the bladder and testis and corresponding thigh. The attacks are associated with frequent urination and high colored urine. An X-ray plate taken shortly before I saw him, at the suggestion of Dr. Hy. W. Berg, showed four calculi in the ureters, two on each side, and an indistinct shadow in the region of the left kidney. The urine was alkaline, contained albumin, considerable pus and a few red blood cells.

Operation was advised, but the patient left for Europe and was operated on in Vienna by Zuckerkandl June 15, 1907, for the left-sided renal calculus. The other calculi were apparently undiscovered, although the patient avers that a number of X-ray exposures were made while at the clinic. It is of interest to note that

* Case presented at a meeting of the Surgical Section of the N. Y. Academy of Medicine, Oct. 2, 1908.

eleven days after this operation an attack of right-sided renal colic occurred, which was regarded by Zuckerkandl as an example of contralateral pain. Since this operation the patient has had frequent attacks of renal colic alternating on both sides.

In January, 1908, he again came under my observation. A Röntgen plate made at this time showed bilateral ureteral calculi in the pelvic portion of each ureter. I operated on him July 20, 1908.

Operation.—Bilateral ureterolithotomy, removing two calculi from the pelvic portion of each ureter.—Through lateral extraperitoneal incisions, and after dividing the aponeuroses of the external oblique in the course of its fibres, and the internal oblique and transversalis muscles across their fibres, the ureters were readily exposed; the calculi were easily found and removed through small longitudinal incisions. The ureteral incisions were closed by interrupted iodine catgut sutures. With the exception of one minute bleeding vessel in the retroperitoneal tissue not a single ligature had to be tied. As drainage I used a red rubber drainage-tube, about the size of the tip of the small finger, through which a strip of iodoform gauze had been pulled, which was placed against the suture lines in the ureter; the tube emerged naturally at about the junction of the middle and lower third of the cutaneous incision. Layer suture of the divided abdominal parietes completed the operation. The operation was one of the easiest I had ever performed, the entire duration of the completed operations being only 55 minutes.

The patient did very well for the next few days, except that on the third and fourth day there was rather more haematuria than I am accustomed to see after ureterotomy; this soon cleared up, however, and had entirely ceased on the fifth day. There was a minimal urinary leakage on the right side, just enough to slightly dampen the centre of the dressing. Primary union ensued, and the stitches were removed on the sixth day.

On July 27, one week after operation, the left drainage-tube was removed. The tube came away easily, but it was immediately followed by a tremendous hemorrhage, which stopped for an instant, and then recurred in sufficient quantity to fill a two-quart pus-basin half full. I promptly introduced a finger, which controlled the hemorrhage at once.

The patient was then anæsthetized, and the wound reopened.

A hole sufficiently large to admit the tip of the little finger was found in the external iliac artery, at a point where it was pressed upon by the drainage-tube. The vessel was ligated above and below the hole with a No. 3 catgut ligature. The wound was then lightly tamponed with gauze.

I was beginning to congratulate myself upon the fortunate outcome of a disagreeable accident, when I lifted up the sheet with which the patient was covered; the sheet happened to catch in the safety pin, which pierced the tube upon the right side and pulled out the tube for certainly not more than half an inch. There promptly ensued an identical hemorrhage. The same conditions were found on this side, and exactly similar steps were resorted to to control the hemorrhage.

It is, I am sure, needless to say, that all pulsation ceased below the seat of the ligature, and both lower extremities became blanched. After the usual abdominal dressings were applied, both lower extremities were wrapped in cotton and bandaged, and patient placed in bed, with legs and trunk slightly elevated.

Despite the formidable hemorrhages, and in spite of the enormity of the operation the general condition of the patient was very fair. On the evening of the same day the toes were warm, of a delicate pink hue, and capable of slight active motion. On the following day slight femoral pulsation was to be felt, and on the third day an occasional flutter was noted in the dorsalis pedis artery. Thereafter his convalescence was entirely uneventful, and patient left the hospital with superficial granulating wounds on September 4; these have now healed entirely.

On the date of writing the above, September 30, the incisions are firmly healed; there is no hernia; pulsation can be felt in both femorals and dorsalis pedis arteries, though somewhat smaller than in the normal.

The points of exceptional interest in this case are the following:

1. That a bilateral secondary hemorrhage from the external iliac arteries was caused by pressure of drainage tubes.
2. That a simultaneous and successful ligature was performed upon both external iliac arteries.

In a cursory examination of the literature I have not been able to find a similar occurrence described, as the one that I have reported. Secondary hemorrhage caused by pressure of drainage

tubes has been described before and has been warned against, particularly in incisions upon the neck. I have also not been able to find another case of simultaneous ligation of both external iliac arteries. Both external iliac arteries have been tied by Makins (*Lancet*, Dec. 2, 1892, and July 22, 1893) for bilateral femoral aneurism at an interval of seven and a half months. In Tillmann's "Verletzungen und chirurgische Krankheiten des Beckens" I also find a reference to a case by Watson in *Agnew's Surgery*, 1878, vol. i, page 667. On referring to the original report, however, I find that Watson merely tied one external iliac. My case therefore appears to be the first case of simultaneous ligation of the external iliacs, successful or otherwise.

It would carry me far beyond the limits of this communication to discuss the probable routes of the re-establishment of the collateral circulation. Sir Astley Cooper's classic case in *Guy's Hospital Reports*, vol. i, gives the collateral circulation eighteen years after ligation of one iliac to be as follows: (1) An anterior set; a branch from the ileolumbar artery communicates with a branch of the circumflex iliac; a branch from the ileolumbar artery with a branch from the obturator; two branches of the obturator artery with the epigastric and the internal circumflex of the deep femoral artery. (2) An internal set, branches of the obturator artery communicating with the internal circumflex branch of the profunda femoris. (3) A posterior set, branches from the gluteal, communicate with an ascending branch of the external circumflex; branches from the sciatic communicate with the internal and external circumflex and perforating branches of the profunda femoris. In cases of injury, similar to the one I report, there is also the important communication of the deep epigastric artery with the internal mammary. In my case the anastomotic circulation was restored very quickly, inasmuch as the dorsalis pedis artery had already begun to pulsate on the third day.

Excluding the interesting anatomical and physiological lessons involved, this case above all teaches the very important lesson, that drainage-tubes should be introduced in this locality with great circumspection or better not at all.

The case gave me some very anxious moments, and the patient can well be congratulated upon the fortunate outcome.

A FURTHER REPORT OF THE OPERATIVE TREATMENT OF ACUTE GONORRHŒAL EPIDIDYMITIS.*

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THE preliminary report upon this subject was presented in March, 1906, as a thesis for admission to The American Association of Genito-urinary Surgeons and was published in The Medical Record of October 13, 1906. In The American Journal of Urology for May, 1906, an article appeared by Dr. L. Bazet of San Francisco entitled "A Preliminary Note on Epididymotomy for Blenorrhagic Epididymitis Based on 65 Cases," in which he states he first performed this operation in 1897, but as there was no published report of his work before May, 1906, I was unaware of his operation and for that reason no mention of it was made in my preliminary paper. His operation differs from mine in that the incision is differently located and that he does not open the tunica vaginalis which has been a seat of marked disease in all my cases. It is interesting to note that the results claimed for his operation are practically identical with those reported in this paper. In his communication he states that patients are up and about in from 4 to 7 days but does not state the rapidity with which the induration of the epididymis disappears, so of course I cannot state whether the results are as good as regards this feature as if the tunica vaginalis had been opened and the fluid nearly always present therein evacuated, the false membrane covering the epididymis removed and the tunica vaginalis irrigated with 1 to 1000 bichloride solution and drained.

Dr. Bazet states that in the last eight years he has operated

* Read before the American Association of Genito-urinary Surgeons at Hot Springs, Va., June 2, 1908.

on 65 cases and says that the operation is benign and that it ought to be performed as soon as the disease is diagnosed. He has found the gonococcus present in one-third of his cases and has never had any atrophy, hernia, necrosis of the testicle or any mortality. In his preliminary report he does not state the percentage of cases in which pus was present nor the length of time the disease had existed before operation.

I will not go into the history of operations for gonorrhœal epididymitis in this report as I took up this point in my original paper. At the time I operated on my first case I had never known of any open operation having been done for this condition. The operative treatment for gonorrhœal arthritis was the procedure that suggested to me the surgical intervention in these cases. I feel it might be well to give a brief résumé of the operation as described in my previous paper, which operation I have found no reason to modify. At a point over the juncture of the epididymis and testicle an incision 6 to 10 cm. long is made through the skin and parietal layer of the tunica vaginalis. After the serous membrane is opened all the fluid is evacuated and the enlarged epididymis examined through the wound. The testicle with its adnexa is delivered from the tunica vaginalis and enveloped with warm towels. The epididymis is then examined and multiple punctures made through its fibrous covering with a tenotomy, especially over those portions where the enlargement and thickening is greatest. The knife is carried deep enough to penetrate the thickened fibrous capsule and enter the infiltrated connective tissue. When the knife is through the thickened covering of the epididymis a very marked lessening of resistance will be felt. If pus be seen to escape from any of the punctures, the opening is enlarged and a small probe inserted in the direction from which the pus flows, then by a backward and forward motion of the probe the opening is enlarged and the pus allowed to escape. By this method I believe there is less danger of injuring the tubes of the epididymis than by cutting with a knife. After the probe is passed in, pus will be evacuated by light massage in the region of the abscess and a fine pointed syringe

is used in washing out the cavity with 1 to 1000 bichloride of mercury, followed by physiological salt solution. The testis is then restored to its normal position, and in every case the tunica vaginalis is thoroughly washed with 1 to 1000 bichloride, followed by normal salt solution. The incision of the tunica vaginalis is lightly closed with a running catgut suture, a cigarette drain of gauze is then applied over the incision, the skin being brought together with a subcutaneous silver wire suture, the cigarette drain passing out at the lower angle of the wound. Silver foil and a sterile dressing are now applied and the part supported by a wide T bandage.

In every case in which I have operated fluid has been present in the tunica vaginalis, varying in amount from two drams to two and one-half ounces; the larger the swelling the greater the amount of fluid. This fluid resembles that seen in gonorrhœal joints, in that it is usually slightly blood-stained and contains a varying amount of fibrous material in which are entangled a few leucocytes. The parietal layer of the tunica vaginalis is congested and that portion of the tunic covering the epididymis is intensely congested and seems to be the seat of small punctiform hemorrhages. In a number of cases the whole of the body, the globus major and globus minor were covered by a false membrane, almost like that of diphtheria, which left a bleeding surface on removal. In fact it is an exception that this condition does not exist to some degree. This membrane is composed of fibrin, a few leucocytes and cell detritus; no gonococci were demonstrable in the membrane but they were present in the pus which escaped by puncture of the epididymis. I believe this description is identical with that in gonorrhœal inflammation of synovial membranes.

On palpation the affected epididymis is discovered to be very much thickened, being more marked in the region of the globus minor. Here it is often of stony hardness and, on puncture, blood of almost tarry appearance will exude. Next to the globus minor, the globus major appears to be the most involved portion and it is in this latter locality that I have

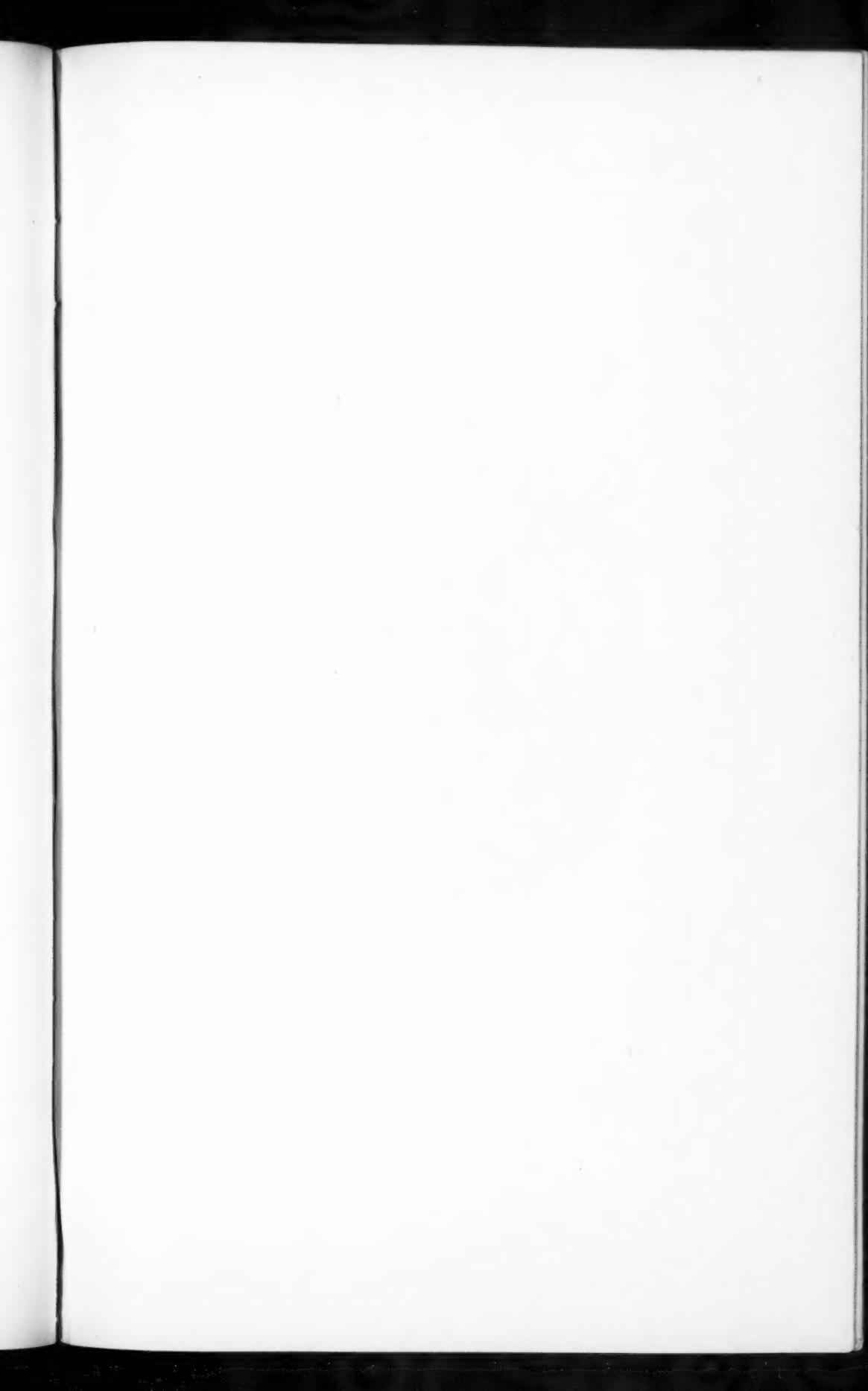
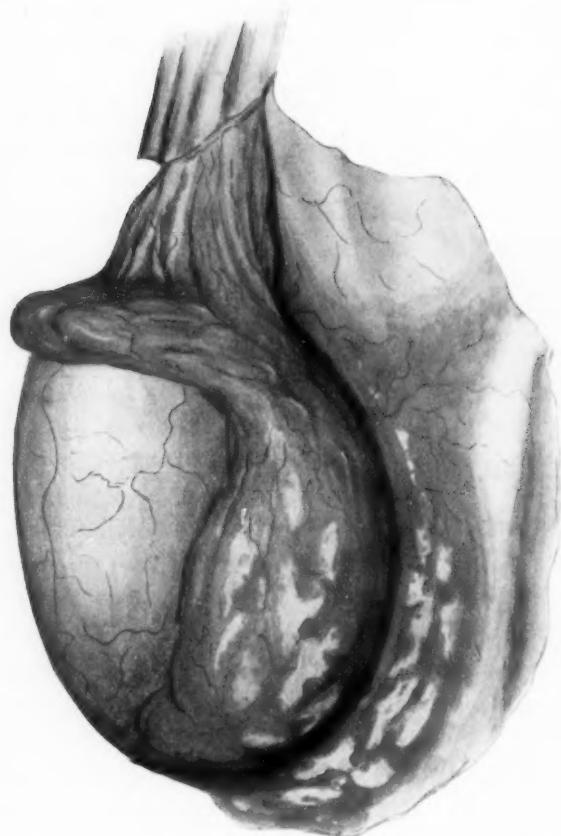
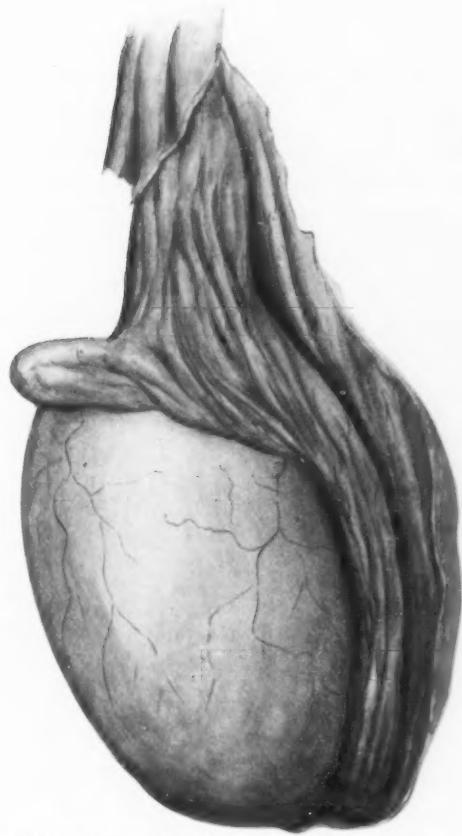


FIG. 1.



Sketch of testicle in gonorrhœal epididymitis showing enlargement of the epididymis and the intense inflammation of the visceral, and edge of the parietal layer of the tunica vaginalis.

FIG. 2.



Sketch of normal testicle; tunica vaginalis removed.

found pus containing gonococci in several of my cases. The body is infiltrated in the same manner but not to the same degree. In a few of the cases there was so much infiltration of the epididymis that the skin and subcutaneous tissue were dissected off the posterior aspect of the epididymis and punctures were made in this region with the exudation of dark blood and pus.

The relief from pain and rapid resolution seem to be just as great whether or not pus be present, and these results are, I believe, explained by the relief of tension due to the multiple punctures of the epididymis, the evacuation of the fluid from the tunica vaginalis and the drainage. The second day after the operation the cigarette drain is removed and the wound is redressed, when there is usually noted a small amount of ooze in the dressings. The drainage continues for from four to six days and in a week the wound is healed. The patients have, in every instance but one, been up and walking around, free from pain, by the seventh day. The remarkable feature is the rapidity with which the induration, not only of the epididymis but of the cord disappears, it being much more rapid than by any other method known to me.

Since March, 1905, over three years, I have operated on but 19 patients, not more than 10 per cent. of my patients of this class, selecting the severest cases only because there may be some doubt whether this procedure affects the tendency to sterility. It is recognized that the organization of the exudate which blocks the tubules is a factor in the production of sterility; the rapid resolution which ensued upon the operation should therefore recommend this procedure as a preventive of sterility. I have operated on but one case that has not been absolutely relieved of all pain on recovery from the anaesthesia. This one case was a very acute and severe form of epididymitis of three days' duration in a very nervous young man, in which there were from thirty to forty miliary abscesses scattered through the epididymis. In this case it was necessary to employ two one-eighth grains of morphine hypodermically during the twenty-four hours following the operation but after

this time the pain entirely disappeared and the patient made an uninterrupted recovery.

It is really remarkable to note the difference in the condition of these patients before and after operation. I have seen some writhing in pain, afraid to have the testicle touched or moved, but after recovery from the anaesthetic they would be absolutely free from pain and even considerable pressure over the affected organ would not cause complaint. The fall of the leucocyte count is rather interesting, the most marked being from 33,000 to 8400 in forty-eight hours. Along with the decrease in leucocytosis is a parallel fall in the temperature curve and pulse, the temperature reaching normal within thirty-six hours and remaining there, or with a very slight fluctuation, not over half a degree. There have been no cases of infection following the operation, nor have there been any cases of recurrence, atrophy of the testicle, or other distressing sequelæ.

A study of the accompanying table shows:

Two cases only had had a previous attack of gonorrhœal epididymitis, in both of which the same testicle was involved in the second attack.

The duration of the gonorrhœa before the epididymitis developed varied from two weeks to six months and as a rule the earlier the epididymitis developed the severer the complication although one case that had had gonorrhœa for six months proved to be one of the severest I operated upon.

The pain in these cases has been of a most severe character not being relieved by the usual medical treatment followed in this disease. Quite a number of these patients experienced no comfort from large and oft repeated doses of morphine, whereas every case was absolutely free from pain immediately following the operation and none of them with one exception had to have any form of anodyne.

The amount of swelling varied, as accurately as we could measure it, from 15 to 31 centimetres in circumference. In most of these cases the induration of the cord and epididymis was very marked, the globus minor being the portion of greatest involvement, although in two cases the globus major

Case	1	2	3	4	
Previous attacks of epididymitis.....	None	None	None	None	
Duration of gonorrhœa.....	15 days	6 months	.....	4 weeks	
Duration of epididymitis prior to operation.....	5 days	5 days	14 days	21 days	
Character of pain.....	Terrific. Morphia without effect	Terrific. Morphia grs. $\frac{1}{2}$ every $\frac{1}{2}$ hour	No relief from morphine	No relief from medical treatment	Very
Character of pain on palpation.....	Unbearable	Unbearable	Excruciating	Great	Mo
Size and appearance of scrotum.....	12 inches in circumference. Skin red	10 inches in circumference	.....	Not great	9 inches
Induration of cord and epididymis.....	Marked in both	Marked in both	Very great	Marked in both	Very
Appearance of epididymis at operation.....	Congested and hemorrhagic	Congested, hemorrhagic and covered with much lymph	Congested and hemorrhagic. Lymph over epididymis	Induration very marked over globus minor	Indurated major
Condition of tunica vaginalis.....	Contained 1 oz. bloody fluid and lymph	$\frac{1}{2}$ ounces blood and serum	$1\frac{1}{2}$ oz. serous fluid	1 ounce bloody fluid	2 ounces
Pus and its location.....	Present in globus minor	Present in globus minor	Present in globus minor	Present in globus minor	Present
Pain after operation.....	None	None	None	None	
Maximum temperature day before operation.....	103°	103.4°	101°	102°	
Maximum temperature day after operation.....	101°	101.2°	99.6°	100°	
Leucocyte count day before operation.....	18,600	14,600	No count	No count	No
Leucocyte count 24 hours after operation.....	9,000	10,000	.....	.....
Gonococci in epididymis.....	None. Culture negative	Present	Present	None	Per
Gonococci in tunica vaginalis.....	None	.....	Present	None	Per
Completion of resolution.....	Very rapid	Very rapid	Very rapid	Rapid	Per
Discharged from bed.....	In 6 days	In 10 days	In 5 days	In 6 days	In
Result.....	Cured	Cured	Cured	Cured	C

TABLE.

12	13	14	15	16	17	18	19	Dr. Fuller's case 20	Dr. Jones's case 21
None	None	None	Yes	None	None	None	None	3 times in 3 months	None.
weeks	3 weeks	6 weeks	Chronic prosta- titis	2 weeks	2 weeks	12 days	32 days	10 weeks	.....
days	7 days	7 days	4 days	8 days	2 days	6 days	15 days	2 days after 3rd case	7 days.
Very severe	Very severe	Very severe	Severe	Very severe	Very severe. No relief from medi- cal treatment	Very severe. Medi- cal treatment unsatisfactory	Very severe. No relief from medi- cal treatment	Very severe. Medi- cal treatment unsatisfactory	Excruciating.
Very severe	Markedly in- creased	.....	Increased	Unbearable	Unbearable	Unbearable	Exquisitely tender	Very tender	.....
inches in cir- cumference	7 inches in cir- cumference. Skin inflamed and indurated	Not marked	Skin indurated	12½ inches in cir- cumference	12 inches in cir- cumference	Very large	Enormous	9 inches in cir- cumference	9 inches in cir- cumference.
marked	Very marked es- pecially in glo- bus minor	Not marked	Cord quite indu- rated and glo- bus minor very hard	Very marked and greatly indu- rated	Great mass of lymph. Tunica vaginalis mark- edly congested. 1 oz. flaky white fluid	.....	Great induration	Cord, globus ma- jor and minor great- ly indurated	Markedly en- larged and in- durated.
Acutely con- gested. Covered with lymph	Intensely inflam- med. Most mark- ed over globus minor	Globus minor en- larged and very hard	Globus minor in- flamed	Cord and globus minor indu- rated	About 30 mili- ary abscesses through globus minor and ma- jor and body of epididymis	Intense inflam- mation and in- duration	Great induration	Great induration	Intensely injected. Covered with lymph.
ances clear- ed. Acutely inflamed	Inflamed. Little fluid and lymph	Not very acutely inflamed	Small amount of fluid lymph over epididymis	1 ounce bloody fluid	1 ounce flaky white fluid	1 ounce flaky serum	1 ounce bloody fluid	1½ ounce serous fluid	2 drams fibrino- purulent fluid.
ent in globus minor	2 drams present in globus minor	Present in globus minor	None	In globus minor miliary ab- scesses in glo- bus major	30 or 40 abscesses throughout	In globus minor	?	None	1½ drams in globus major and also in tunica vagi- nalis.
None	None	None	None	None	Slight for 15 hours	None	None	None	None.
101.4°	103.4°	100°	99.5°	102°	103.5°	104°	100°	103.5°	102°.
100.2°	100°	99°	98.4°	100°	100°	97.8°	98.4°	99.4°	99.2°.
8,250	12,000	16,266	No count	No count	15,000	33,000	15,800	No count	18,000.
No count	No count	10,700	No count	No count	10,000	8,400 in 48 hours	No count	No count	12,000.
None	None	None	None	Culture and cover- slips negative	Very numerous	.....	.....	None	None.
None	None	None	None	None	None	.....	.....	None	None.
Very rapid	Rapid	Rapid	Rapid	Fairly rapid	Complete in 7 days	Rapid	Very, very rapid	Fairly rapid	Very rapid.
6th day	On 4th day	On 4th day	On 5th day	On 4th day	On 7th day	On 4th day	On 3rd day	On 5th day	On 4th day.
Cured	Cured	Cured	Cured	Good 1 week after developed acute prosta- titis	Cured	Cured	Cured	No return since	Cured.



was the portion most involved and at operation was seen to be the seat of abscess formation.

The fall in temperature in these cases is rather significant. In every case the temperature has been lower after operation than before, and in one patient it dropped from 104 to normal in the first twenty-four hours after operation. Running parallel with this drop is a marked decrease in leucocytosis, the most marked being from 33,000 to 8400 in forty-eight hours.

Pus was present in 17 of the 21 cases, being in the globus minor in 12 cases, in the globus major and minor in 3 cases, in the globus major in one and in the tunica vaginalis in one case, this latter having no abscess involvement of the epididymis.

Of these 21 cases the gonococci were demonstrated five times in the pus from the epididymis and once from the tunica vaginalis when none could be found in the epididymis.

One of the most remarkable effects of this operation is the very rapid disappearance of the induration in both the cord and the epididymis. The wounds are usually healed in less than a week and unless rather carefully palpated the affected side would escape notice. None of the patients have had the hard nodular condition of the globus minor lasting for a long time, such as persists so frequently in those treated without operation.

Taking an average of the time in which the patients were up and about and entirely free from pain we find it to be five days. All these patients recovered without complications; none of them have had relapses and in some of the patients the improvement of the urethral condition following the operation has been very marked. We notice so often in gonorrhœal epididymitis treated medically that as soon as the epididymitis improves the urethral discharge seems to increase—this increase of discharge does not occur in cases upon which epididymotomy has been performed. It has occurred to me that possibly when the epididymis is punctured drainage of the vas may result. I cannot say definitely whether this operation lessens the liability to sterility of the affected side, but I might

add that I have carefully massaged the ampulla of the vas deferens and the seminal vesicles of the affected side and obtained motile spermatozoa, but I have never been absolutely sure that in massaging, fluid from the opposite side was not expressed, but I do know that it stops the pain, that the repair is very much more rapid and that the patients are most grateful for the relief of their suffering.

FINGER ENUCLEATION OF THE TONSIL.

A METHOD FOR THE REMOVAL OF WHOLE TONSILS IN CHILDREN.

BY FRANK S. MATHEWS, M.D.,

OF NEW YORK,

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UNTIL recently operations on the tonsils whether done by surgeons, paediatricians, laryngologists or others have consisted in the removal of what may be called the excess of adenoid tissue. Recently, the laryngologists have attempted a more thorough operation using a variety of methods and instruments, in the endeavor to remove the entire tonsil.

In favor of the old method, tonsillotomy, is its simplicity as an operation. Moreover, in some hands the tonsillotome may remove nearly all of an elevated tonsil and a goodly portion of a buried one, though in the latter case, the anterior pillar is likely to suffer. Without doubt the vast majority of cases subjected to tonsillotomy in the past have been much benefited temporarily or permanently. On the other hand second or even third removals are not uncommon, especially if the first operation is performed in early childhood. The base, too, of a tonsil can afford a portal of entry to bacteria (including the tubercle bacillus) as well as a whole tonsil. Indeed, a child may have its first attack of follicular tonsillitis shortly after a tonsillotomy.

Some operators in their anxiety to remove the tonsil completely have replaced the exceedingly minor operation of tonsillotomy by a fairly formidable dissection requiring hours rather than minutes for its accomplishment. Tonsillectomy is desirable; but a quick easy operation is also. The operation to be described has been performed in a great many cases at St. Mary's Hospital for Children with perfect satisfaction, with all kinds of tonsils, elevated, flat, buried and irregular. Many of the flat and soft tonsils have come out whole by this

method where we could not succeed at all by the old tonsil-lotome or newer snare methods. Before settling upon the method to be described we had experimented with several varieties of pillar separators with bistoury, long handled scissors, snare and punch and with a number of different positions for operating. These instruments have largely proved disappointing though they may have a distinct field of usefulness when the patient is an adult and no general anæsthetic is used.

We use ether as the anæsthetic of choice—under no circumstances chloroform, considering it more dangerous in these cases with their tendency to cyanosis than in the common run of surgical cases. Recall the fact that minor anæsthesia and childhood are no safeguards against the dangers of chloroform. Ether is given with paper cone and without preceding it with nitrous oxide. A child is etherized so quickly that the latter affords no advantages. Etherization is continued two to four minutes, depending on the child's age until a stage of primary anæsthesia is reached, but not to the stage of obliteration of pharyngeal or corneal reflexes. The danger of inspiring blood though slight is less when reflexes are not impaired. The patient is placed horizontally on a low table with the head at the end of the table but not hanging over. The operator takes the place of the anæsthetist at the head of the table. A gag is inserted and held by the anæsthetist who controls the head and presses upon the tonsil from without if desired. If the tonsil is thoroughly enucleated this is of small moment.

The jaws are gagged just widely enough to admit one or two fingers; wide gagging interferes with the child's breathing. No effort is made to control the movements of the fingers by sight. The whole operation is done by the sense of touch.

We describe first the removal of the right tonsil. The gag is placed in the left side of the mouth; the index or index and middle fingers of the right hand inserted and their palmar surface applied to the right anterior tonsillar pillar. By several strokes of the finger along the pillar from above downward a plane of cleavage is found and the tips of the fingers

felt to enter between the outer fibrous tissue-covered surface of the tonsil and the inner surface of the pharyngeal wall.

If, as is less frequently the case, the tonsil adheres to the posterior pillar, the palmar surfaces of the fingers are then brought in contact with the exposed surface of the tonsil and the tonsil forcibly pulled forward, or rotated on its vertical axis, toward the mouth. The adhesions to the posterior pillar separate easily. Next one inserts the finger into the space made by separating the anterior pillar from the tonsil, turns the palmar surface toward the tonsil and brings it in contact with its upper pole. With the finger above the tonsil and the pillars thoroughly separated from it the tonsil is pushed inward toward the pharynx and downward toward the epiglottis, thus stripping it laterally from the pharyngeal wall. The tonsil, now out of its natural bed between the pillars, remains attached only by a band of mucosa at its lower pole. One can now, if he desires and as we have repeatedly done, tear away this remaining attachment with the fingers; but it is more difficult and time-consuming than the preceding steps of the operation and consequently we complete the removal by using a Mackenzie tonsillotome of small size and small aperture. The blade is drawn back, the instrument inserted with the finger over the aperture and the blade pushed home only when the finger feels that the tonsil has engaged.

The gag is then as a rule shifted to the right side of the mouth and the left tonsil enucleated with the fingers of the left hand. Inspection of the tonsil after removal shows a whole tonsil in a capsule of connective tissue. Rarely are any muscle-fibres of the pharyngeal wall found attached to it.

After the tonsils are out the finger explores the vault of the pharynx and if adenoids are present they are removed with the curette. We never use the finger or gauze covered finger to remove growths from Rosenmüller's fossa because of the certainty of thereby producing traumatism to the lateral pharyngeal wall in the vicinity of the Eustachian prominence and thereby favoring middle ear complications. The mouth

is more widely gagged for the removal of adenoids than for tonsils.

This operation requires but a couple of minutes and the child is out from the anaesthetic almost immediately.

We have performed the finger enucleation now many hundreds of times and believe it to be a method superior to ordinary tonsillotomy in that it is a complete removal of all tonsillar tissue. As in all other methods of removal so in this, the larger the tonsil the easier the removal. But the writer is convinced that he can remove many tonsils too flat or buried for success with the simple tonsillotome method, and others too soft for a tenaculum forceps to maintain its hold. In all cases after using the various pillar separators a further enucleation has been found possible with the finger.

After thorough enucleation with the finger it is not of great consequence what instrument one uses to detach the small remaining pedicle. It can be done with tonsillotome, blunt scissors or snare. The thing of first importance is the thorough enucleation of the tonsil from its bed between the pillars. We prefer the Mackenzie tonsillotome simply because one can use it by touch alone and avoid consuming time in sponging away blood to get a view of the parts.

There has been no case of bleeding requiring treatment after finger enucleation though we have had two fairly severe cases after tonsillotomy. The amount of bleeding during the operation is rather greater than with tonsillotomy. In the finger enucleation vessels are torn rather than cut and can readily retract into the normal tissues of the pharyngeal wall. No case of injury to the pharyngeal wall has occurred. It is avoided by keeping the fingers in contact with the tonsil and never directing them against the pharyngeal wall.¹

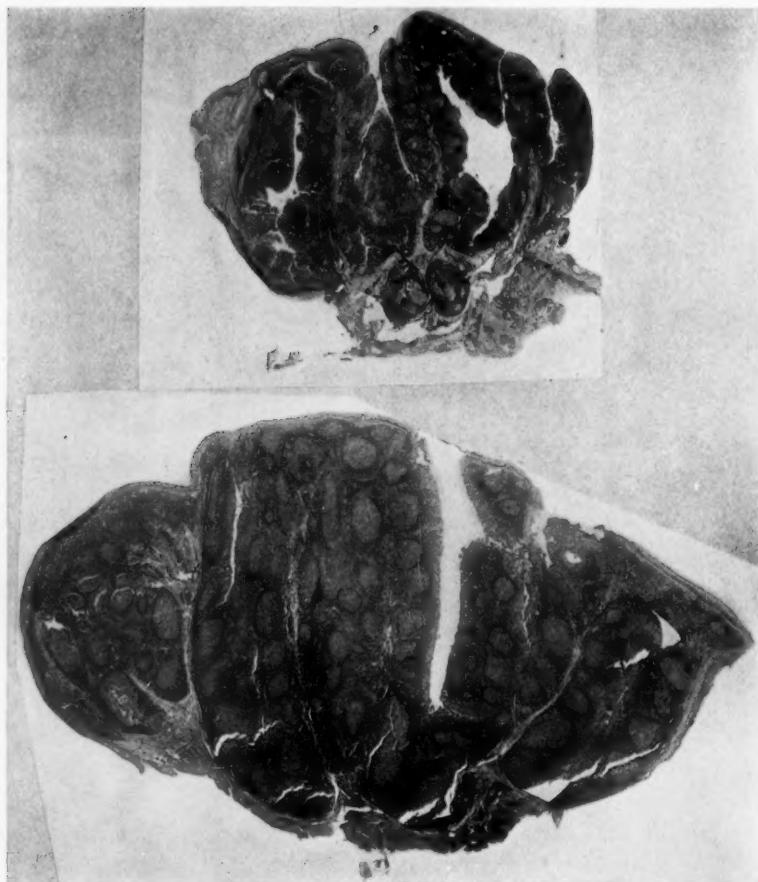
¹ Some fear injury to the carotid in tonsillotomy. The tonsil is separated from the carotid by the superior constrictor, styloglossus and stylopharyngeus muscles. Moreover it lies posterior to the muscles, *i.e.*, nearer the vertebral column. The carotid will not be injured by finger dissection or the tonsillotome but may be by tonsil punches if pressure is being exerted from without. If pressure is to be made from without it should be applied in front of the vessels.

FIG. 1.



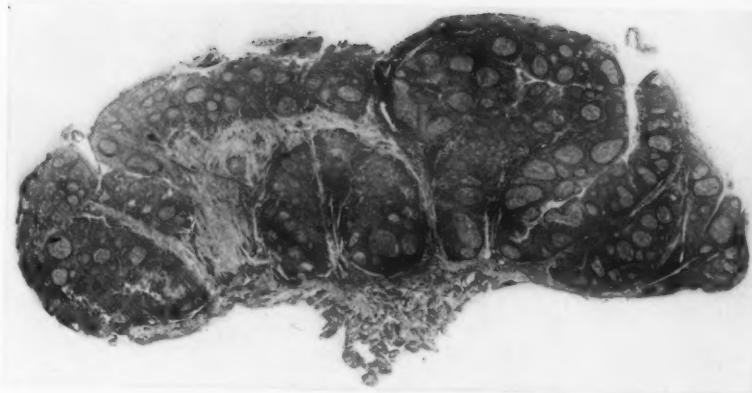
Section of a deeply buried tonsil. The flat surface is the one directed toward the mouth.

FIGS. 2 and 3.



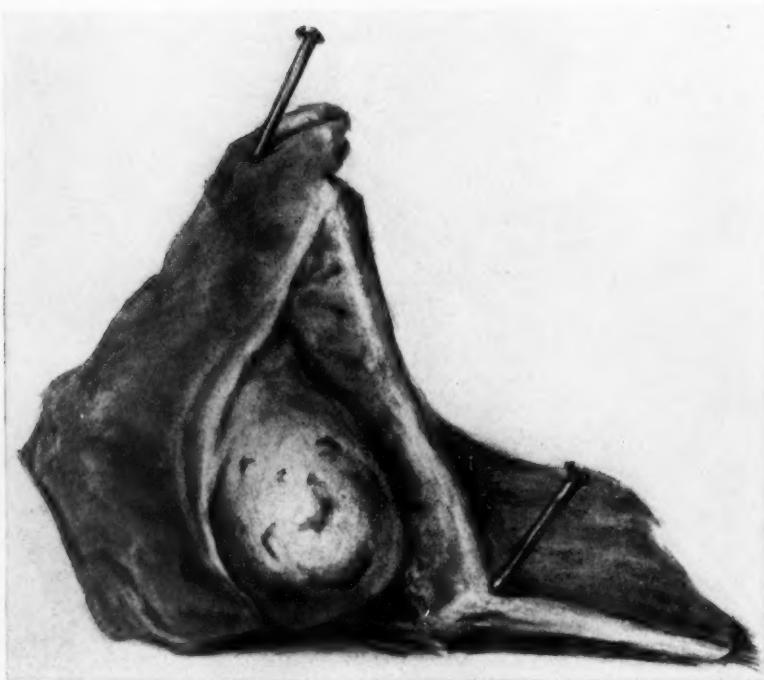
Small soft, ragged tonsil, with deep crypts, base deeply buried.
Section of a large partially elevated tonsil, only partially removable by a tonsillotome.

FIG. 4.



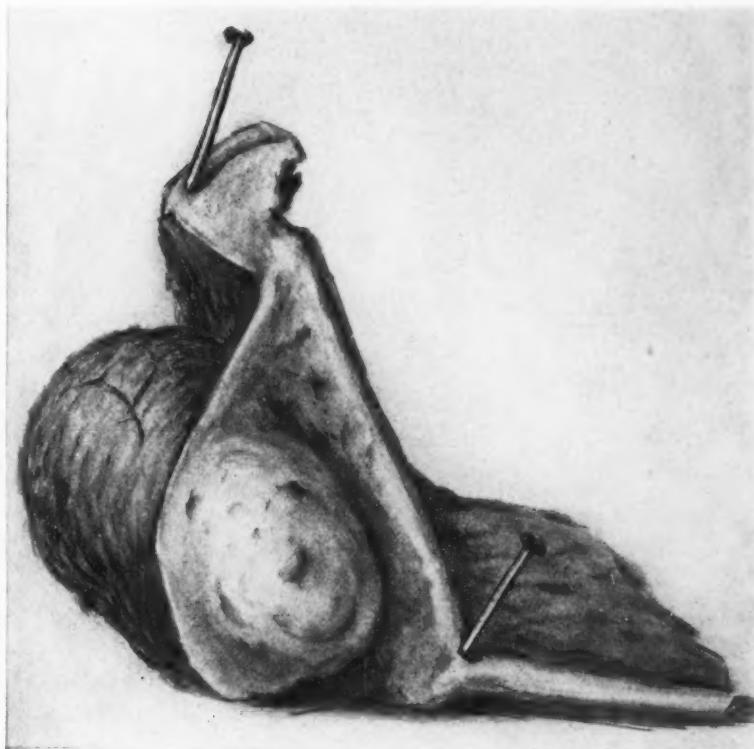
An elevated large and flat tonsil.

FIG. 5.



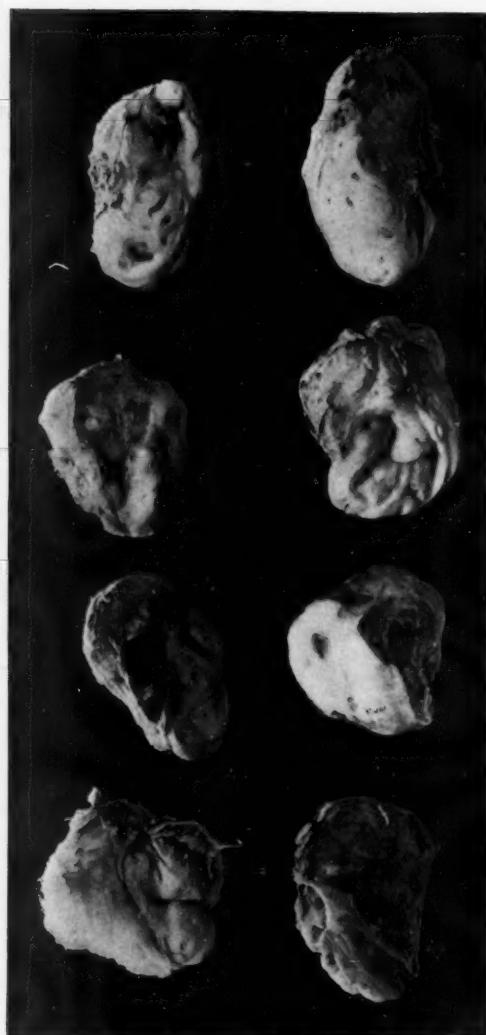
Portion of lateral wall of pharynx removed to show superficial portion of tonsil projecting to a moderate degree into fauces.

FIG. 6.



Same specimen as in Fig. 5 with anterior pillar of fauces dissected away so as to reveal the buried portion of the tonsil.

FIG. 7.



Deeply buried tonsils after enucleation.

The microphotographs shown illustrate different forms of tonsils removed by the method. Fig. 1 is a deeply buried one: The flat surface is the one directed toward the mouth. This tonsil was removed by fingers alone with no help from the tonsillotome. Fig. 2 shows the small, soft, ragged tonsil with deep crypts from which a volsellum would easily tear out. A good portion of this tonsil was buried from view. Fig. 3 is a large, partially elevated one, part of the base of which would surely have remained *in situ* if the tonsillotome alone had been employed for its removal. Fig. 4 illustrates an elevated large and flat tonsil. All these are whole tonsils as is shown by their capsule of connective tissue.

The two companion drawings (Figs. 5 and 6) were made from a portion of a lateral pharyngeal wall removed at autopsy. The first shows very well an apparently small elevated tonsil easily removable with the tonsillotome. The second of these drawings shows the same specimen from which the anterior pillar has been dissected away, revealing the much larger buried portion of the tonsil. This is a common condition and very favorable to finger enucleation. The buried portion of a tonsil usually lies above and external to the visible one. There is usually a deep crypt leading from the upper part of the visible portion into the buried tonsil. The eight tonsils photographed (Fig. 7) are good illustrations of deeply buried tonsils all removed entire. The view of them presented is that which one would have had by looking into the mouth, with the exception of the fact that the larger buried portion was covered by the anterior pillar. In most of them one can readily differentiate in the photograph the smooth mucosa-covered surface from the rougher connective-tissue capsule.

The advantages claimed for the finger enucleation of tonsils as above described are:

1. Whole tonsils are removed—a tonsillectomy.
2. The anaesthesia is primary and of short duration.
3. The operation requires but a couple of minutes even when adenectomy is added.

4. The armamentarium is simple and cheap; but three instruments are used, a mouth gag, a Mackenzie tonsillotome, and an adenoid curette.

5. Only one assistant is needed, either physician or nurse: in the latter case one can give the anæsthetic himself.

6. Skill in enucleating tonsils with the fingers is easily acquired by any one familiar with the anatomy of the parts. Our resident physicians learn to do it perfectly well after a few trials.

7. As it is done entirely by feeling one is not interfered with by the presence of blood and mucus in the throat.

8. Convalescence is no longer or more painful than after tonsillotomy.

In brief, we have found the operation a quick, safe, simple and thorough one.

BLASTOMYCOSIS OF THE SPINE.

DOUBLE LESION: TWO OPERATIONS: RECOVERY.

BY GEORGE EMERSON BREWER, M.D.,

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New York; Surgeon to the Roosevelt Hospital.

AND

FRANCIS CARTER WOOD, M.D.,

Professor of Clinical Pathology in the College of Physicians and Surgeons,
New York.

THE following case of blastomycosis of the spinal column, with two separate and entirely distinct foci of infection, is of sufficient rarity and interest to justify this report.

D. S., male, aged 20, of Russian birth, came to America six months before his admission to the Roosevelt Hospital in December, 1906. His previous personal history was negative. Three months before admission he began to complain of pain in the back. He was examined at the out-patient clinic of one of our large hospitals, was told that his trouble was muscular rheumatism, and was given appropriate treatment. The pain was not relieved, and several weeks later, there appeared pain at the epigastrium, which was more or less intermittent at first, and was generally more severe after his mid-day meal. Shortly after this he noticed stiffness of the back, and moderate tenderness between the shoulder blades. Two weeks before admission, his brother called his attention to a swelling over the upper dorsal spine.

On admission to the hospital, his chief complaints were pain and stiffness of the back, severe and almost continuous pain in the upper abdomen, general bodily weakness, loss of appetite and weight.

Examination.—A poorly nourished boy with pale sallow complexion. Heart and lungs normal. Tenderness in left upper quadrant of the abdomen, but no muscular rigidity. Liver and spleen not palpable. On exposing the back, there

was found an oval tumor in the midline immediately over the spines of the second, third and fourth dorsal vertebræ. The tumor was covered by apparently normal skin, which was not adherent. There was no heat nor redness. On palpation the tumor was elastic but not frankly fluctuating, was about 8 cm. in diameter, could not be made to disappear on pressure. There was no pulsation. The mass was moderately sensitive. The spines of the second and fourth dorsal vertebræ could be palpated, but that of the third could not be felt. There was absolute rigidity of the upper dorsal spine.

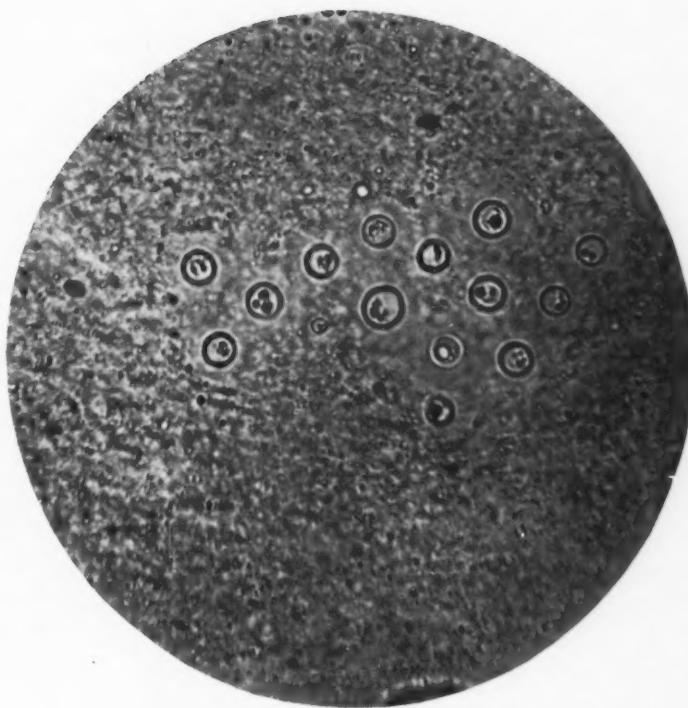
The patient was examined by several members of the hospital staff, and opinions were about equally divided between a diagnosis of soft sarcoma, and a tuberculous osteomyelitis of the arch of the third dorsal vertebræ.

Temperature on admission 99.8° ; pulse 90. Urine cloudy, 10.26, faint trace of albumin, no sugar; the sediment consisted of amorphous urates.

Two or three days later an aspirating needle was introduced into the mass and a syringeful of dark colored pus removed. On microscopic examination the fluid was found to consist of pus and blood, and a large number of blastomycetes (Fig. 1).

On December 20, under ether anæsthesia, an elliptical incision was made over the centre of the mass, which included a portion of the skin lying directly over the spinous processes of the second, third and fourth dorsal vertebræ. The skin and subcutaneous areolar tissue were then dissected away from the median line on both sides, until the entire tumor, covered only by the superficial muscles, was exposed. An attempt was then made to dissect the entire abscess-cavity free before opening it. In this we were unsuccessful. On opening the cavity about 100 c.c. of dark colored pus was evacuated. The spinous process of the third dorsal vertebra was entirely necrotic and removed; the corresponding laminæ were eroded and in places necrotic, the diseased areas were scraped away by a sharp bone curette. The walls of the abscess-cavity were thick and covered with large granulations. A portion of the cavity

FIG. 1.



Blastomycetes in fresh pus from abscess.



extended nearly to the left scapula beneath the rhomboid muscles. The entire wall was dissected out, and all diseased bone and infiltrated muscle and fascia removed. After thorough irrigation and the application of a solution of 1-100 formalin, the wound was closed by several layers of buried sutures, and an aseptic dressing applied.

The operation was followed by a slight reaction only, the temperature reaching 101.5° on the second day. First dressing on the third day. Cigarette drain removed and replaced by small gauze wick. Stitches removed on the twelfth day. Primary healing of wound except at drain opening, which continued to secrete a small amount of yellow serum until his discharge, fifteen days after operation. Before his discharge from the hospital a careful examination was made of his entire body, with a view to finding a primary focus or point of entry of the infection. The result of the examination was negative. The sputum, obtained by forced cough, and the stools were examined for blastomycetes, but with negative result.

The patient returned to the hospital for dressing several days later, and the wound was found to be completely healed. The abdominal pain had largely disappeared, but the spine was still rigid.

On February 21 the patient again applied for admission to the hospital, complaining of backache and a painful swelling in the lumbar region. The temperature was normal; pulse 84. Haemoglobin 95 per cent., leucocytes 21,400, polynuclears 80 per cent., eosinophiles 2 per cent. On examination, there was found a fluctuating tumor just to the left of the midline over the region of the upper three lumbar spines.

Two days later under ether anaesthesia, a curved cutaneous incision was made surrounding the periphery of the tumor, and the flap dissected toward the median line of the back. A large abscess cavity was entered containing about 120 cc. of yellowish pus. Two or three of the spinous processes were found to be involved, and these with the walls of the abscess and surrounding infiltrated muscles were completely removed, leaving a large cavity, which could not be completely ob-

literated by suturing the neighboring muscles together. The wound, however, was closed as completely as possible and a cigarette drain introduced in the lower angle.

A careful examination of the seat of the previous operation was made, and no evidence of local recurrence discovered. Slight reaction followed the operation. First dressing on the seventh day, when the wound was found to be nearly united.

His condition remained satisfactory with normal temperature and pulse until the fourteenth day, when the temperature rose to 104° ; pulse 114. On dressing the wound for the third time it was found to be badly infected, probably an accidental contamination at the previous dressing. Drainage was introduced, and daily dressings thereafter with irrigation and packing.

He made a slow convalescence, but was discharged from the hospital on the twenty-sixth day after operation with the wound nearly healed. He returned for dressings at intervals, and in a short time the wound was completely closed. After this he returned at infrequent intervals, each time reporting improvement in general health, and a gradual diminution in the stiffness of the back.

He was last seen and examined in March, 1908, about one year from the date of his last discharge from the hospital. At this time he reported that he was in perfect health, had gained about twenty pounds in weight, and was able to do his regular work as a waiter in a down-town restaurant. The wounds are solidly healed, no induration or tenderness. Mobility of spine nearly normal, a slight rigidity still present in the upper dorsal region, chiefly noticed when he attempts to arch the spine backward.

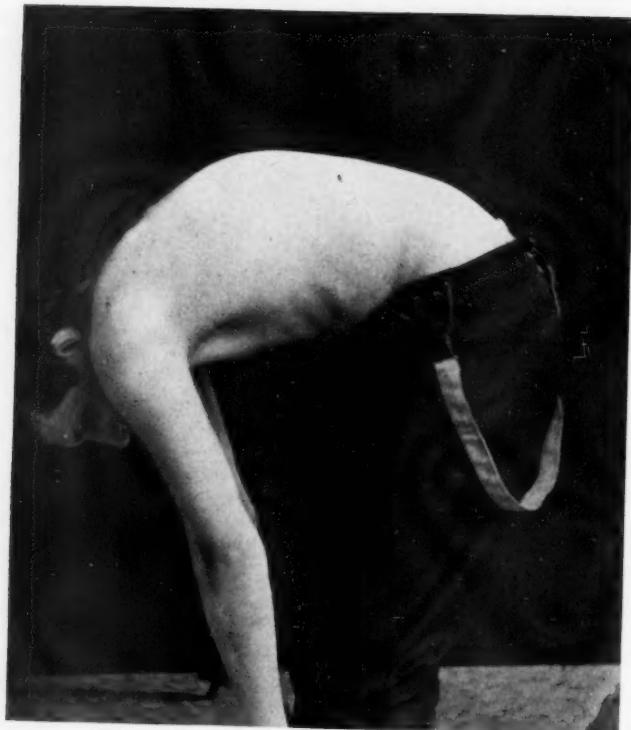
Fig. 2 shows the appearance of the back in the erect position; Fig. 3 when bending forward, and Fig. 4 when bending backward. All of these movements as well as lateral bending of the spine, are executed without pain or discomfort of any kind.

FIG. 2.



Appearance of back at present time in the erect position.

FIG. 3.



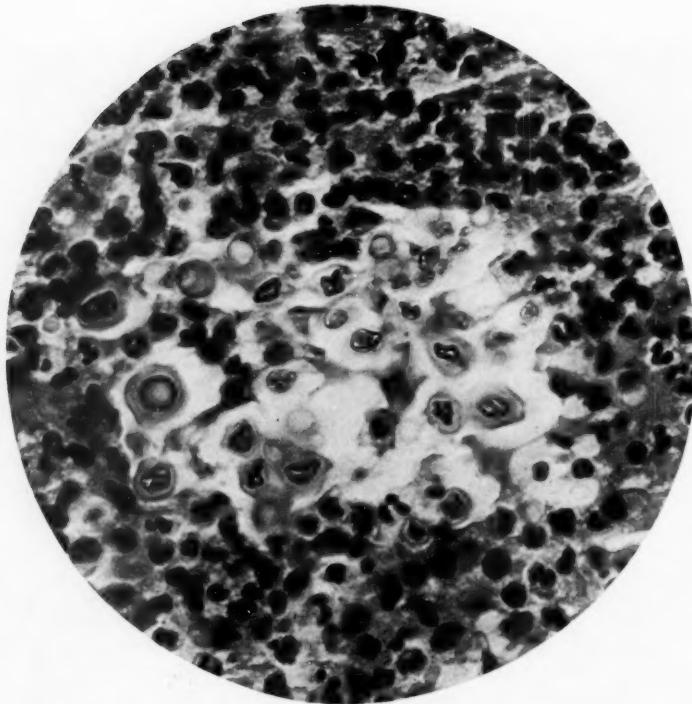
Appearance of back when bending forward.

FIG. 4.



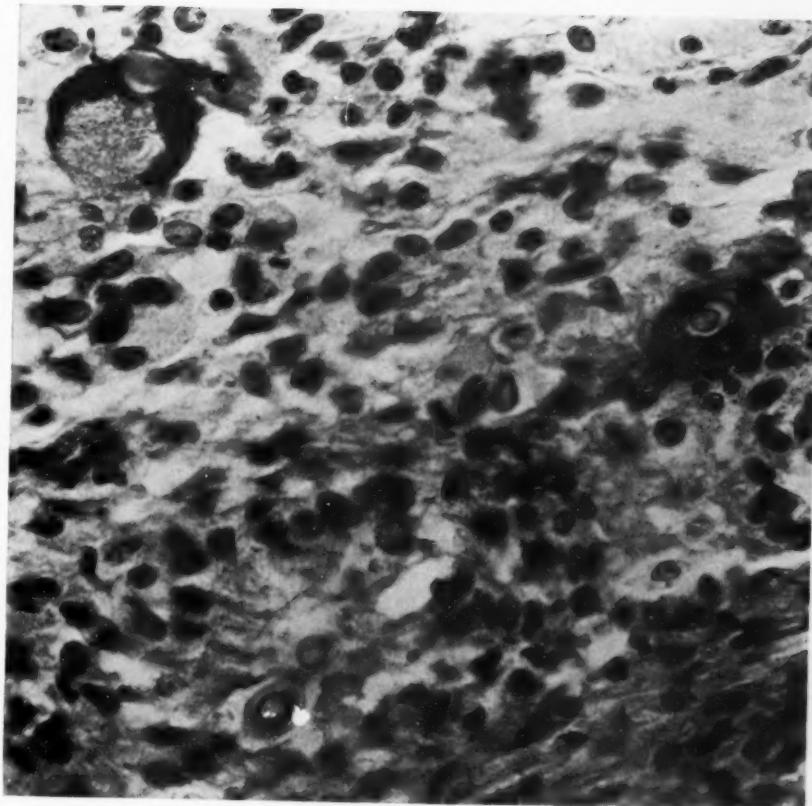
Appearance of back when bending backward.

FIG. 5.



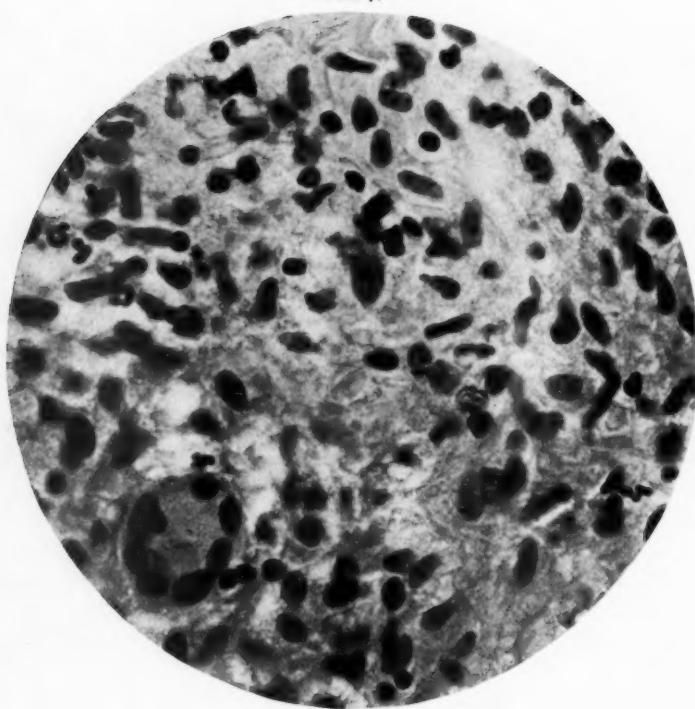
Mass of blastomycetes in granulation tissue. Many of the organisms are shrunken and irregular in form; others are well preserved. The granulation tissue is very loose and oedematous and contains numerous eosinophile and plasma cells. There is as yet no distinct giant cell formation in this portion of the tissue.

FIG. 6.



Granulation tissue containing a moderate number of blastomycetes and two phagocytic giant cells; also numerous plasma and eosinophile cells.

FIG. 7.



Firm granulation tissue with a single giant cell, containing only a remnant of a parasite. From the periphery of the abscess.

Examination of the fresh pus removed from the abscess at the first operation, showed a large number of blastomycetes (Fig. 1). The organisms were doubly contoured; none of them were budding. The central portion of the parasite contained from one to five small, spherical bodies which were highly refractile. These particles were surrounded by a thick cell wall, and outside of this a broad gelatinous capsule. The organisms measured from 10 to 25 micra in diameter. The fluid contained a large number of polynuclear neutrophile and eosinophile cells, showing albuminous and fatty degeneration. On the addition of a small amount of aqueous solution of thionin, the clear peripheral portion of the blastomycetes took on a faint bluish stain, while the central part became deeply colored, especially the small spherical bodies.

The material obtained for pathological examination consisted of fragments of bone from the spinous process and laminæ and the abscess wall.

Microscopical examination of the bone removed showed no blastomycotic organisms in or about the bone substance; there was, however, considerable inflammation with a rarefying osteitis. In the wall of tissue which lined the abscess-cavity there were a very large number of parasites, many of them lying either surrounded by granulation tissue (Fig. 5) or imbedded in giant cells (Fig. 6). Occasionally giant cells were seen which did not contain any organisms. There were also many giant cells which contained partly digested organisms (Fig. 7), either irregular in form or without the usual gelatinous capsule.

The inner surface of the abscess wall was covered with débris, blood and leucocytes. External to this was a firm layer of granulation tissue containing parasites and many giant cells. Outside of this was the connective and muscular tissue of the back. The muscles were infiltrated with leucocytes which occasionally formed small miliary abscesses. In some places the granulation tissue had become quite firm so as to form a dense capsule beyond which the organisms did not penetrate.

The granulation tissue did not offer any peculiarity except

for the large number of giant cells and the fact that it contained a very large number of eosinophiles and plasma cells, many more than in granulation tissue due to ordinary pyogenic cocci. The poison excreted by the blastomycetes seems to incite a productive inflammation rather than the necrosing and suppurative types seen with the staphylomycoses.

The organisms were isolated in pure culture by Dr. Hans Zinsser, and when injected into animals (guinea-pigs) reproduced the human lesions perfectly, the animals frequently showing typical nodules or abscesses with giant cells, and granulation tissue. Each giant cell usually contained one or more of the blastomycetes. The lesions were especially interesting in the spleen and lung.

The blastomycotic nodules in animals resembled roughly fresh miliary tubercles. They ranged in size from minute points to the size of pin-heads.

The lesions in the abdominal lymph-nodes of some of the animals were very extensive; the nodes were large and hard. The changes were chiefly of a productive type, a moderate amount of connective tissue surrounding large masses of blastomycetes. Microscopically the lesions in all the organs were much alike, differing only in minor details and corresponding in most essentials to those observed by other investigators.

In the spleen the lesions showed an astonishingly large number of giant cells with nuclei about the periphery. In animals which did not seem to resist the infection well there was very little giant cell formation and much more tissue necrosis than in the animals which seemed likely to survive the infection and had to be killed. In the lung in guinea-pigs killed after four or five weeks, the nodules consisted of a central area composed of parasites of varying size, some budding and some retaining their extraneous capsule. They were usually close together, and where they were very numerous, portions of the lung appeared anaemic and resembled somewhat infarcts; but microscopically these appearances seemed to be due to collapse of the alveoli. Between the parasites were thin fibrils of connective tissue, the meshes of which often contained granular

detritus, resembling products of coagulation necrosis as seen in tuberculosis. Immediately about this, there were numerous young connective tissue cells and large swollen epithelial cells in the half destroyed alveoli. A moderate number of eosinophile cells were present. Giant cell formation was much less active in the lung than in other tissues, an observation previously made by Gilchrist.

The cultural characteristics of the organism were as follows: Growth was slow, small, grayish, punctate colonies appearing after forty-eight hours on glycerin agar. On agar slants they grew only to a slight depth, but very actively on the surface, forming a heaped-up yellowish creamy growth. On potato, growth was heavy and white. On litmus milk, there was growth but no change in the fluid. On gelatin, there was no liquefaction, but this was due possibly to the almost imperceptible growth at room temperature.

Unlike most of the organisms of a similar type which have been described, this form of blastomycetes grew very poorly in all fluid media, and to this may be due the absence of fermentation in dextrose, lactose, and saccharose tubes, and in dextrose, lactose, galactose, maltose, mannit, saccharose, levulose, and dextrin tubes of the Hiss serum waters.

Reproduction was by budding, and in no case even in the agar and gelatin hanging drops were mycelia observed. Observations on this point were continued for over three months on artificial media. In old cultures the daughter cells grow and bud again without detachment from the mother cells, thus forming strings of organisms. Such organisms may be seen separated from each other by a considerable distance, yet connected by a thin, straight, bridge-like line which takes the stain of the protoplasm of the cell.

In a case of Hektoen's there was apparent symbiotic relation between a pseudodiphtheria bacillus and the blastomycetes. In the pus removed from this patient there was morphologically a Gram-positive coccus which did not appear in the cultures after incubation. This apparent inhibitory effect of the

blastomycetes on other organisms agrees with the experience of Gilchrist and Stokes.

The exact biological position of the parasite found in this case is still obscure. From the results of the cultures it is evident that the organism differs somewhat from those previously described in which abundant mycelium is produced. It also differs from the parasite producing the coccidioidal granuloma of the Pacific coast, cases of which have been recently collected by Brown (*Journal of the American Medical Association*, *xlviii*, 1907, 743). At present all that can be said is that it belongs to the group of organisms classified as blastomycetes.

The literature of the pathological aspects of the subject has been very thoroughly reviewed by Ricketts (*Journal of Medical Research*, New Ser., *i*, 1901, 373), Buschke (*Bibliotheca Medica*, 1902), Bassoe (*Journal of Infectious Diseases*, *iii*, 1906, 91), and Coley and Tracy (*Journal of Medical Research*, New Ser., *xi*, 1907, 237), and need not be reproduced in full here.

ARTERIOVENOUS ANASTOMOSIS FOR GANGRENE.

THE REPORT OF A THIRD CASE.

BY JOSHUA C. HUBBARD, M.D.,

OF BOSTON, MASS.,

Assistant in Surgery Harvard Medical School; Assistant Surgeon Boston City Hospital.

CATHERINE C., 84 years old, entered the Boston City Hospital on November 23, 1907, with the following history:

One year ago a sore appeared on the anterior part of the right ankle which was treated with applications of mutton tallow and alcohol. The skin came off and an ulcer resulted. The foot became swollen, tender and painful. For the last three weeks these conditions have been becoming worse so that sleep is prevented.

The big toe was found to be in a condition of dry gangrene with moist gangrene of three other toes and a portion of the dorsum of the foot.

The urine was high, 1020, acid, free from albumin and sugar.

On December 5 the thigh was amputated at the junction of the middle and lower thirds by Dr. F. B. Lund. The pathological report states that the vessels were arteriosclerotic.

A bed-sore developed, but the patient was discharged on January 20 with sore and stump healed.

On March 14, 1908, she re-entered the hospital and stated that about the middle of February a "bed-sore" came on the left heel. The sore had been growing larger and more tender, especially rapidly during the last few weeks.

Examination at this time showed a very thin garrulous old woman of fair development. Lungs: in backs many moist râles, slight dulness. Heart: no murmurs, regular in rate and force. Right leg amputated above the knee. Left leg normal, except for local condition. Cataract in right eye. Left heel presents on posterior under aspect an area $2\frac{1}{2}$ inches in circumference in which the skin and underlying tis-

sues are necrotic. The foot was said to have been cold, but how far up the cool area extended is not known. Urine: pale, 1020, acid, free from albumin and sugar.

On March 23 under ether an arteriovenous anastomosis was done. An incision was made over Scarpa's triangle on the left leg and carried down to the vessels. The vein and artery were dissected free for about three inches. A Crile clamp was placed on the artery below the origin of the profunda and the artery was ligated with catgut as far down as possible. A Crile clamp was then placed on the vein as low down in its course as it was possible and a catgut ligature about its upper portion. The vessels were then divided. Although the outside of the artery had appeared normal with no areas of arteriosclerosis, the lumen was found to lie eccentric and to be about half its proper size with the walls thickened by soft tissue. An arteriovenous anastomosis was then done connecting the upper end of the artery with the lower end of the vein. Fine silk sutures on fine sewing needles were used, the walls of the vessels being turned so that intima came in contact with intima according to Carrel's method. When the suture was complete the clamp was removed from the vein and then the artery. There was some bleeding at the suture line which was controlled by two additional sutures. The blood current then passed through the joint, the vein filled out and the pulsations could be felt below the anastomosis. During the placing of the sutures the lumen of the vessel had been frequently washed out with salt solution in a medicine dropper. The soft tissues and fascia were then sutured over the site of the anastomosis and the skin incision was closed. A spica bandage was applied holding the thigh flexed on the body, and as soon as the patient was in bed, pillows were placed under the knee.

Immediately after the operation the lower half of the leg was cold and the upper half warm, a definite line separating the two areas. This line of demarcation gradually went down the leg till on March 27 the toes alone were cool. At this

time a definite oedema of the lower part of the foot had appeared.

By April 5 the foot was warm and comfortable and the patient up in a wheel chair. The superficial slough at this time was removed from the original area of gangrene over the heel, leaving a firm, dry, fibrous tissue base with an edge which bled somewhat. At about this time a bleb appeared over the dorsum of the big toe and some over the patella. These were pricked and dusted with powder and never showed any tendency to spread, though a discolored area persisted.

On April 26 it was noticed that without any apparent reason the whole leg had become decidedly oedematous. From this time there was no very marked change in the local condition except that a cool area about three inches wide encircling the middle of the leg appeared while the foot and upper leg remained warm. The sloughs on the heel and over the big toe began very gradually to extend and a bed-sore which had developed over the sacrum showed no improvement. The general condition of the patient became gradually poorer and she gradually failed and died from senility on May 26.

In review, the important features of the case are these: A foot previously cool is rendered warm and slightly oedematous by an arteriovenous anastomosis. The original area of necrosis remained latent after the operation, where as before it was said to have been growing rapidly, and its edge began to bleed. This condition continued till the general condition of the patient failed, when the area began to increase in size. Clinically, then, a very decided immediate change followed the operation and was therefore probably caused by it.

An examination of the local conditions after death was allowed and the pathological report by Dr. Lawrence J. Rhea follows:

Autopsy May 27, 1908.—On the left heel there is an ulcerated, depressed area about 3 cm. in diameter. The tissues immediately about it are considerably discolored. There is an area of sharply demarcated gangrene involving the great toe. On the inner side of the knee on the left side

there is a sharply outlined, punched out ulcer 4 cm. in diameter and about 5 mm. deep. The subcutaneous tissue has entirely disappeared. The underlying muscles are distinctly visible and show some necrosis.

In the inner border of Scarpa's triangle on the left side there is a linear scar running down in the direction of the leg, measuring 8 cm. long. An incision is made from Poupart's ligament down through the central portion of Scarpa's triangle, the skin and subcutaneous tissue are dissected back and the femoral artery and vein exposed. These two vessels are carefully removed. At their upper end they are cut across as high up as possible, just a little above Poupart's ligament. The lower extremities are cut about half way down the leg. The tissues attached to this artery and vein are carefully dissected away and the artery and vein laid open. The upper portion of the femoral vein ends blindly a short distance below the profunda vein. In this same region the lower end of the femoral artery ends as a blind sac. In both the lower end of the artery and upper end of the vein the lumen was occluded by a light gray, rather elastic tissue which is slightly adherent to the vessel wall. (Thrombi which are undergoing organization.) The lumen of the upper end of the femoral artery is continuous with the lower end of the femoral vein. The point of union of the lumens of these two vessels is quite distinct and is marked by a band of thickened, dense scar-tissue. Immediately below this point of union there are seen a set of normal valves upon the vein. Both the artery and vein in the region of their point of union contain a pale elastic tissue which is quite firmly adherent to the vessel wall. This material (thrombi) would seem to have, at least for the most part, occluded the lumen of the vessel. The femoral artery is thickened throughout, the portion examined has practically lost its elasticity and shows several areas of calcification. The lower end of the artery, which has been tied off, is thicker than the upper end, its lumen being greatly infringed upon.

Remarks.—The artery shows marked arteriosclerosis.

Its lumen is quite markedly narrowed. This narrowing seems to be more marked, comparatively, below the profunda artery than above it. The upper end of the femoral vein and its branches are occluded by a thrombus which is undergoing organization. The lower end of the femoral artery contains a thrombus which is being organized. The point of union between the upper end of the femoral artery and the lower end of the femoral vein seems to have entirely healed, scar-tissue being deposited. The thrombus found at this point of union and extending into both the artery and vein shows some organization. Since these vessels are already diseased and the patient is old and her recuperative properties greatly decreased, it is difficult to tell how long this thrombus has been forming.

Had no post-mortem examination been allowed I should have considered the operation to have been a success. Now, however, the age of the thrombi in the vessels is the determining point as to the success or failure of the anastomosis. If the thrombus at the anastomosis formed soon after the operation and is equally old with those in the ligated vessels then the operation was a failure. If, however, it formed later due to the failing strength of the patient at a time when clinically a sudden and marked edema appeared in the leg then it is fair to consider that the operation had been a success. When the pathologists cannot determine the relative age of thrombi who is to decide?

Of the three cases of arteriovenous anastomosis done by me for senile gangrene the first was reported in the *ANNALS OF SURGERY* for October, 1906. The patient was seen in May, 1908, and the amputation stump was found well nourished. (Amputation was done at the point of election on the tibia for gangrene of the foot existing previous to the anastomosis.) The second case was a failure in that a clot formed immediately at the site of the anastomosis. The success or failure of this the third case is not determined.

As I have watched the reports of cases of arteriovenous anastomosis and as my own ideas have become crystalized

from the observation of these cases, I feel that so far nothing very brilliant has been accomplished. I shall nevertheless continue to suggest this treatment in appropriate cases since the operation is free from all shock and can do no harm other than necessitate, if it fail, a second etherization for an amputation.

A MODIFICATION OF THE GRITTI AMPUTATION WITH SPECIAL REFERENCE TO NERVE BLOCK- ING AND REGIONAL ANÆSTHESIA.

BY JONATHAN M. WAINWRIGHT, M.D.,

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RECENT advances in surgical physiology have placed on a firm foundation the necessity of nerve-blocking during amputations that may be accompanied by shock. In numerous publications various authors have conclusively shown that if the nerve impulses are so blocked that the additional depressing influences produced by the amputation are prevented from reaching the medullary centres, amputations and other operations can be done with no effect whatever on the blood-pressure, providing there is not much hemorrhage.

Several years ago the author published a large number of animal experiments in which it was conclusively demonstrated that such an effect could easily be obtained by spinal anaesthesia. If an anaesthetic such as stovaine is injected into the spinal cord so as to produce a complete anaesthesia, the lower parts of the body are practically entirely cut off from the vital centres. Trauma produced on these parts has no more effect in causing shock than if this trauma was made on another individual. Since this publication we have carried our own work a step further and found that the same result can be obtained if the principal nerves in the limb are injected with stovaine. This procedure thoroughly carried out has an efficient effect in preventing shock and also eliminates the small danger which is present with spinal anaesthesia.

The Gritti amputation admits of such a simple method of applying nerve-blocking or regional anaesthesia that we believe the technic which has been adopted for this purpose will be of interest. First of all it is understood that the term "Gritti Amputation" applies to all amputations at the knee in which the patella is attached to the sawed end of the femur. By

this method amputation can easily be performed with practically no pain and without general anaesthesia. However, if the patient's condition warrants it we generally use ether also, in order to eliminate the psychic influences that are present during an operation in full consciousness.

Technic.—After the usual cleansing the skin is infiltrated with stovaine in the upper angle of the popliteal space. A skin incision about two inches long is then made in the upper angle and the external and internal popliteal nerves are easily found in this situation. In order to prevent any pain from the injection of the nerves a few drops of stovaine are applied to the outside of the nerves and after waiting a moment a small hypodermic needle can be thrust into the nerve trunks and enough of the stovaine solution injected to cause a marked swelling of the nerve trunk. This being done to both nerves the incision is then deepened and the popliteal artery identified and ligated in the upper angle of the popliteal space. The vein is not disturbed at this point, as it is important after ligating the artery to elevate the leg for a few moments to allow as much blood as possible to flow back into the general circulation. The stovaine solution used is 2 per cent. or 4 per cent. according to the quantity one expects to use.

The next step is to carry the previous longitudinal skin incision straight down the popliteal space to the level of the tubercle of the tibia. An incision is then carried straight across the front of the leg on a level with the tubercle. If ether is not used, it is necessary to infiltrate this incision. When ether is used this need not be done. The skin flap thus outlined is dissected up for a short distance until the ligamentum patellæ is exposed. The knee-joint is then opened through the ligamentum patellæ, all the capsular structures cut away and the tissues in the popliteal space cut straight across on a level considerably below the point of injection of the nerves and the ligation of the artery. This leaves the head of the femur projecting from the wound. The entire head is sawed off sufficiently high so that the patella will come down over it without any tension. The posterior cartilaginous surface of the patella is then sawed

off, so that a flat bony surface can be applied to the end of the femur.

Satisfactory stumps have been obtained by us through fixing the patella in place by means of heavy chromic stitches passed through the periosteum and available fascia surrounding both bones. However, the pull of the extensor muscles is sometimes considerable, so that it has been found better to re-enforce these fascial stitches with one heavy chromic stitch passed through drill holes in both bones. This having been done the muscles and fascia surrounding the bones are brought snugly together with plain catgut stitches and the skin sewed in such manner that when finished it presents the shape of an inverted "T," the skin suture being on the posterior surface of the leg and some distance above the lower end of the stump.

The advantages of the above plan of operating have been very apparent to us and we believe that with its use a number of cases have been led to a successful recovery who would have died without this plan of operation. We have published a number of the blood-pressure charts taken during these operations which show that they can be performed in this way with practically no effect whatever in regard to shock; furthermore, the possibility of amputating by this plan without ether is of great advantage in certain cases. Two of the cases have been brought to successful recovery by amputating without ether, and in both cases (numbers 7 and 11 below) we feel that the administration of ether alone would have been fatal even though no operation had been done.

Another great advantage which belongs to the Gritti amputation in general is the satisfactory condition of the stump. Every surgeon who does many amputations will recall cases where the patients have complained bitterly of pain in the stump, although the stump itself may be apparently in good physical condition. These conditions are very distressing to both patient and surgeon, and unfortunately a revision of the amputation does not always give relief. In one case of our own after an amputation of the arm, the pain was so great that we were led to cut all the nerves in the brachial plexus, and

even this procedure gave practically no relief. Of the twelve cases in which we have done the Gritti amputation in the last few years we have been able to trace six for periods varying from two months to three years, none of the cases traced have complained of any pain whatever in their stumps.

A third great advantage in this form of amputation lies in the fact that the patient can, if he wishes, use a peg leg. This is of greater importance to working people as artificial legs are expensive and frequently get out of order if used in very active work. Of the cases we have been able to trace, five have been doing active work in the mines with peg legs which are practically less expensive than ordinary shoes. While most of these cases have artificial legs for dress occasions, they nearly all say that they can walk just as well and a few can walk better with their peg legs.

For the above reasons we have come to feel that the Gritti amputation as outlined above is an ideal method and it is now the one which we use in any case around the knee-joint, and we believe it is much preferable to any form of operation which leaves a tibial stump less than six or eight inches long.

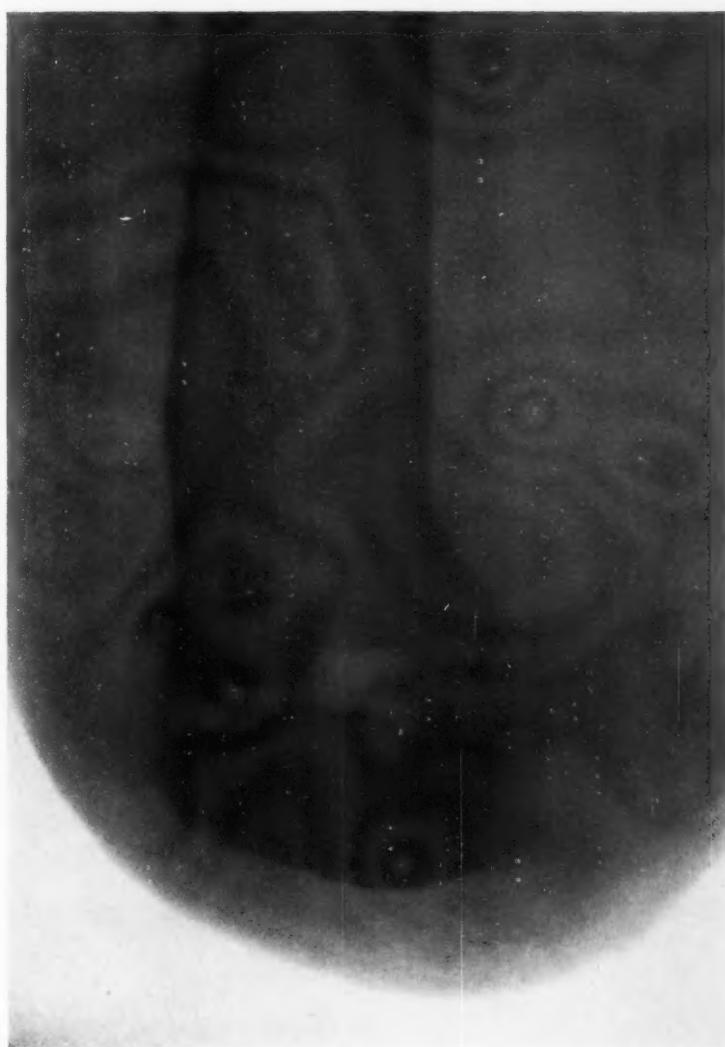
ABSTRACT OF CASES.

CASE I.—Leg caught between bumpers of car; gangrene followed and amputation in middle of leg two weeks after accident. Second amputation, Gritti type, on account of sloughing of flap ten days later. Nerves not blocked. On discharge stump healed and in good condition, no pain. Left for Old Country.

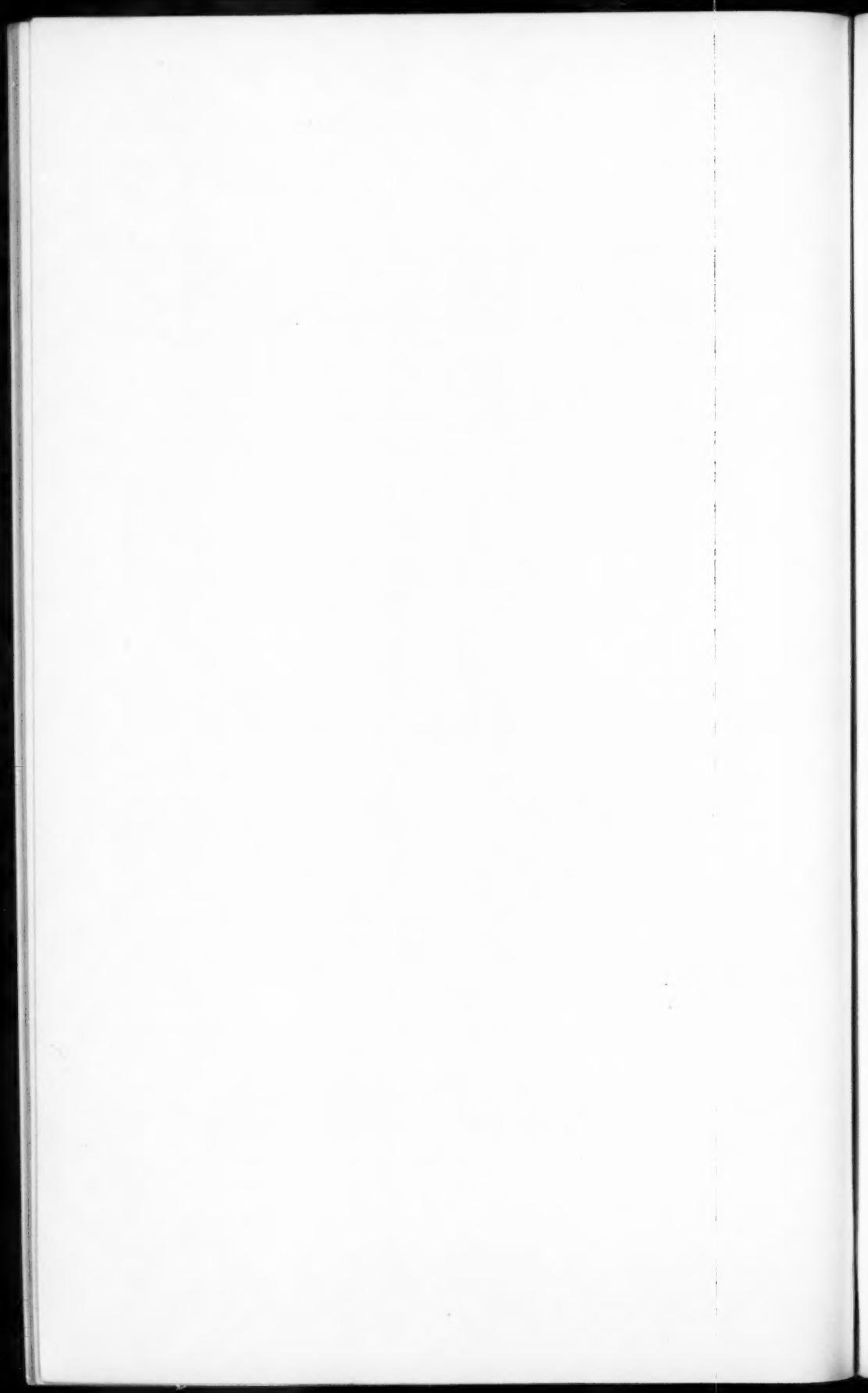
CASE II.—Leg amputated about 4 inches below knee for run-over accident when patient was three years old. Came to hospital on account of painful conical stump. Stump of tibia is about 4 inches long and is badly ulcerated over end. Typical Gritti amputation; ether without nerve-blocking. On discharge wound healed and stump in good condition. Examined three years later; is working in mines says that he never has any pain while at work. He uses a peg leg which he bought for \$2.00; has an artificial leg which he uses when dressed up.

CASE III.—Large mass of coal fell on leg, hopelessly crushing bones and soft parts. Immediate typical Gritti amputation;

FIG. 1.



CASE V.—The stump in Gritti's amputation two years after operation.



ether without nerve-blocking. On discharge wound healed, stump in good condition. Seen three years later; stump in good condition. Has no pain at all, working as switch-tender in mines. While working uses a peg leg which another miner made for him; uses an artificial leg for dress occasions.

CASE IV.—Leg crushed between a car and a mine pillar. Crushed portion became gangrenous, presumably from blood clot in one of the large vessels. Eight days after injury typical Gritti amputation. Ether with nerve-blocking. On discharge wound healed, stump in good condition. Examined three years later; has no pain whatever in stump. Has worked regularly as an upholsterer, uses an artificial leg which carries all the weight on the end of the stump.

CASE V.—Leg run over by mine car twelve hours before admission; brought to hospital in bad condition of shock and hemorrhage. Condition on admission very poor, so that patient had to be given intravenous infusion; crushed leg dressed temporarily and patient put to bed to react from primary shock. Twelve hours later patient in fair condition; a typical Gritti amputation performed with nerve-blocking. Pulse rate and blood pressure same at end of operation as at beginning. On discharge wound healed; stump in good condition. Seen two years later, has no pain whatever, doing work in the mines. Uses peg leg while at work, has a patent leg for dress occasions. Plate I shows the stump in this case two years after operation. In this case the patella was fixed to the femur with chromic stitches passing through the periosteum and fascia only.

CASE VI.—Buffalo Branch. Severe crush of leg. Immediate Gritti amputation. In bad condition on admission and died twenty-four hours later from shock and hemorrhage.

CASE VII.—Leg run over by mine car. Admitted to hospital seven hours later in marked shock; pulse 110, temperature 98. Leg dressed temporarily and patient put to bed to await reaction. The following morning condition was considerably improved; Gritti amputation with regional anaesthesia, as outlined in text. Operation was painless and blood pressure readings during operation show practically no change. Wound did well, but patient died three weeks later as the result of other injuries.

CASE VIII.—Crushing injury to leg. Immediate Gritti amputation. Ether with nerve-blocking. Blood pressure before

ether 130, at end of operation 140. Seen eighteen months later, has no pain, working in mines as a pump runner. While working uses a peg leg which cost \$15; has an artificial leg for dress. Says that he can walk much better with the peg leg than the artificial one.

CASE IX.—Buffalo Branch. Crushing injury to leg. Marked shock on admission, intravenous infusion before operation, typical Gritti amputation under ether. Seen eight weeks later; wound healed, patella firm, no pain. Since left for Old Country.

CASE X.—Run over by car four hours before admission. In considerable shock on admission. Operation delayed nine days in hopes of saving leg. Typical Gritti amputation, ether, nerves not blocked. On discharge wound healed, stump in good condition. Left for Old Country.

CASE XI.—Struck in popliteal space by a piece of coal shot from blast. Taken home at first in care of family physician. Popliteal vessels were evidently cut and signs of gangrene appeared at once. Brought to hospital on day following injury; general condition very bad, loud double heart murmurs, large amount of albumin and casts in urine, looks septic, and area of gangrene is extending. Administration of ether impossible. Two days after admission typical Gritti amputation with regional anæsthesia, as outlined in text. Operation painless and without shock. Immediate satisfactory recovery, and later the heart murmurs and urinary condition entirely cleared up.

CASE XII.—Run over by car one hour before admission. On admission general condition good. Immediate Gritti amputation with ether and nerve-blocking; no shock produced by amputation. Seen six months later; no pain; has not procured a satisfactory artificial leg.

SKIN GRAFTING OF THE HEEL: BY MEANS OF A FLAP FROM THE OPPOSITE THIGH.*

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THE condition that in this case made a skin grafting operation of the heel necessary, was not only a defect of the skin proper, but a loss of the subcutaneous fat, which not only acts as a buffer for the bone, but also, by interposing a soft cushion between it and the skin protects the latter from injury. When we consider the anatomical relations of the heel, formed as it is by the os calcis, a very strong bone, and its muscular and ligamentous attachments, and covered by this cushion of fat and skin, it is easy to understand the reason why in crushing injuries of the foot, the soft parts are frequently torn away from the bone without injury to the latter. This separation may be complete at the time of injury, or may take place later as in the case to be reported, owing to infection or insufficient blood supply of the torn soft parts. When such separation does take place, the heel is practically formed by the os calcis, to which, when the parts are healed, the new skin becomes intimately adherent. This new skin, even though healthy, cannot long resist the injury to which it is daily subjected, and soon breaks down and ulcerates. For this reason this patient, who has had such a crushing injury of the foot, came to us; and it was imperative, not only to remedy the skin defect, but also to furnish, if possible, a new cushion of fat. This cushion is not furnished in the ordinary methods of skin grafting, such as the Reverdin and the Thiersch. The new skin in such methods also becomes intimately adherent to the bone and will not long remain intact. The only way the heel can be covered and furnished with a new cushion is by

* Read, and case shown, before the Jefferson Co. Med. Soc., Sept., 1908.

some sort of a flap operation, the flap being taken from a part of the body which naturally has a thick layer of subcutaneous fat.

Numerous methods of flap grafting have been devised for different parts of the body. Among the best known is the Italian method of covering defects of the nose by means of a flap from the arm, the hand being placed on the head and held in that position until healing takes place. Skin defects of the hand are frequently covered by flaps with two pedicles from the abdomen or back. Defects of the leg have been covered by a flap taken from the opposite leg. In all of these, the object is merely to secure healthy skin, that is pliable and will not contract. In this case, however, it was necessary, as already stated, to furnish a fatty cushion besides covering the heel and as the results were fairly good it was deemed of sufficient interest to report.

The following report consists of a short history and a description of the condition of the foot, together with the various steps of the operation as it was performed:

H. K., age eighteen, referred to me by Dr. T. F. Shinnick, Watertown, Wisconsin. Twelve years ago while flipping a train got his left foot caught between the air brake and the wheel. The injuries of the foot sustained at that time as near as can be ascertained were as follows: The soft parts were torn from the bone from a little below the ankle down to the toes. The foot was literally stripped of its flesh down to the toes but the ankle joint was not injured. The tarsal bones, the os cuneiform and the cuboid, near their articulation with the metatarsal bones, were either fractured or dislocated, as were also some of the phalanges. The parts were restored as nearly as possible and the skin sutured. In healing, a great deal of the skin became gangrenous and had to be cut away. So much for the injury.

The examination of the foot at the time of the operation showed that there is a slight limitation of motion in the ankle-joint, especially of flexion, it being limited to ninety degrees. Beginning a little below the ankle-joint, the foot is (Fig. 4) covered by scar-tissue which is smooth and shiny but somewhat dis-

colored. It hugs the bony skeleton very closely but is quite pliable, except over the heel where the scar is intimately adherent to the bone. This scar-tissue extends on the dorsal surface as far forward as the base of the toes, and on the sole of the foot it covers the heel. Laterally it extends in an irregular manner down almost to the sole; over the cuneiform and cuboid bones and the proximal ends of the metatarsal bones, irregularities can be seen and felt which are either callosities, the result of fracture or slight dislocations of the bones themselves. The arch of the foot is not broken down, but the tarsal and tarsometatarsal joints are ankylosed. The toes are considerably crippled; the fourth and fifth are dislocated forward at the metatarsal phalangeal joints, and the distal phalanx of the third backward, giving that one the appearance of a hammer toe. Motion such as flexion and extension is entirely lost, except in the great toe and the second toe, where it is very much impaired. All the other functions of the foot are quite well preserved. The skin of the heel, as already stated, is very intimately adherent to the bone. Scattered over the heel are numerous ulcers of different sizes which have persisted almost continuously since the injury and from which he seeks relief.

Operation, March 31, 1908. The preparations for the operation were very thorough. The patient was put to bed for four days and the leg and foot were shaved and repeatedly scrubbed with soap and water and warm bichloride dressings 1:2000 applied every four hours. The opposite thigh was also shaved and thoroughly scrubbed and warm bichloride dressings applied; just previous to the operation, the parts were again scrubbed and dressings of normal salt solution applied; nothing but normal salt solution was used for the hands and for the sponges after the preliminary preparation had been made.

The operation consisted in first denuding the heel by means of a scalpel of all its scar-tissue. The surface denuded was approximately two and one-half inches in width by three and one-half in length. It was then curetted and particular attention paid to haemostasis. All bleeding was stopped by means of pressure and torsion and sponges wrung out in hot saline solution. After all the bleeding had been stopped, a dressing of normal salt solution was applied.

The second step of the operation consisted in raising a flap

on the opposite thigh. This flap was about four and one-half inches in length and about three and one-half in width (Fig. 1). The outlines of it had been marked on the thigh by means of a silver nitrate pencil and were obtained previous to the operation in the following manner: A sheet of paper was folded snugly over the right thigh (the thigh was selected on account of the thickness of the subcutaneous fat) and the left foot was then brought into position (Fig. 2). A flap was then cut in the paper and the heel covered with it. This was repeated several times and the pattern selected which seemed to fit the heel most accurately. The incision was commenced at about the middle of the anterior surface of the thigh, about nine inches below the anterior superior spine of the ileum, and was continued downward and a little outward for a distance of four and one-half inches. Another incision at right angles to the first commenced at its lower end and was directed outward and a little upward for three and one-half inches. These incisions were not straight lines but somewhat curved to fit the corresponding edges of the denuded heel (Fig. 1). They were made down to the muscle and the flap included between them was raised. The skin and subcutaneous fat were further undermined to such an extent that the flap, when complete, would correspond to a rectangle of which the two incisions formed the inner and lower sides. Perfect haemostasis of it and the denuded thigh was also sought and they were compressed for a short time with hot saline solution.

In the third step of the operation, after covering the denuded surface of the thigh with rubber tissue, the parts were brought in position (Fig. 2) by flexing the left leg at the knee and applying the foot to the thigh in such a manner, that the denuded surface of the heel would be completely covered by the flap. In this position the corresponding edge of the flap and denuded heel were carefully approximated by means of lead plates and silkworm gut, the left or inner margin of the flap to the upper or right edge of the heel, and the lower margin of the flap to the anterior edge of the heel. When this was done, by slightly moving the foot outward, the flap was made to roll over and hug the heel very closely. At a point a little to the left of what would eventually become its right border, the flap was now sutured by means of lead plates and catgut to the left edge of the denuded heel. After a copious dressing of gauze wrung out in warm saline

FIG. 1.



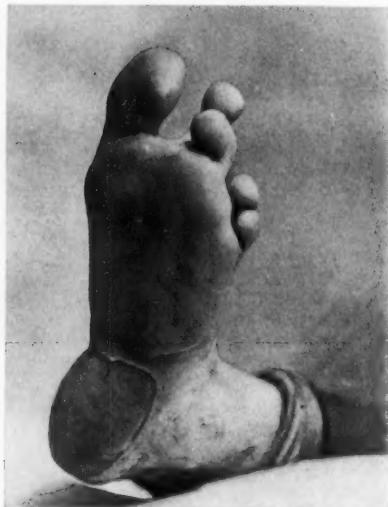
Shows the general outlines of the incision and the scar left on the thigh.

FIG. 2.



Shows the position in which the leg was held by the plaster cast. This position was not painful to maintain and there was no special difficulty when the leg was released.

FIG. 3.



Shows the condition of the heel two months after operation. The new heel looks like a patch that had been pasted on.

FIG. 4.



A profile shows that the greater part of the foot is covered by scar tissue and that the new heel has considerable thickness. It also shows the scar and what remained of the attempt to jump a flap.

solution and cotton, the foot was held in position by means of adhesive strips and a plaster cast (Fig. 2). The first dressing was allowed to remain in position for six days. At the end of this time, owing to the odor, a window was cut in the cast and the parts carefully cleansed and dressed. At this time it was noted that the flap looked healthy and had grown firmly to the heel.

The fourth and fifth step of the operation consisted in cutting the pedicles with a pair of scissors; the upper one on the seventh day and the lateral one on the ninth day.

Remarks.—At the time of the first dressing on the sixth day, the flap was firmly adherent to the heel. On the ninth day, it was freed from the thigh by cutting its lateral pedicle, because it was thought that a sufficient length of time had elapsed to enable it to get its nourishment from the heel. Shortly after this pedicle was cut, it became very congested with venous blood. This congestion gradually disappeared about the fourth or fifth day. At about the same time it was noticed that a small strip had become gangrenous. This strip was about one and one half inches in length and about one half inch in width, and was situated along its outer border. The whole thickness of the flap did not become necrotic but only a very small strip about one eighth of an inch in width at its extreme outer edge, where it had not become adherent to the denuded heel. This strip was cut away and after the parts had become healthy, an attempt was made to cover it by jumping a flap from the outer aspect of the ankle. This procedure was an entire failure. The portion of it, which was to cover the heel died, and the remainder was turned back into its original place. The scar caused by this operation can be seen in Fig. 4. Some time later, when the wound of the thigh where the flap had been removed, was being covered with Thiersch grafts, a few were also placed on this part of the heel to expedite healing. The patient was discharged from the hospital May 18, about two months after his admission. At that time the heel was entirely covered but the wound of the thigh was only partially healed.

The condition of the heel at the present time, almost two

months after the operation is very satisfactory. The patient is an active young man, and has been on his feet a great deal, but as yet there has been no recurrence of the ulcers. The skin is pliable and furnished with a good cushion of fat. Pressure does not cause any pain and he is able to bear his weight on it. The appearance of the heels is quite remarkable. The skin covering it stands out in marked contrast to the other parts of the foot and its borders are very well defined. Fig. 3. It still retains its characteristic appearance, being covered with hair and retaining its fat and looking as though it was a patch which had been pasted on the heel. The interesting feature of this case is, of course, the cushion of fat which was furnished in this method of skin grafting and which was about three fourths of an inch in thickness at the time of operation.

The question, of course, arises, will the result be permanent or will the fat atrophy? Can the fat of the heel which is of a fine granular variety with a great deal of connective tissue interspersed, be replaced by ordinary subcutaneous fat from another part of the body? This question, of course, can only be answered after a sufficient length of time has elapsed.

SOME DEFORMITIES OF THE HAND.

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THE following patients with deformities of the hands seem of sufficient interest to be recorded.

CASE I.—*Web Fingers and Other Deformities.*—The patient, a man 58 years old, presented himself at my clinic for a callus on the sole of his foot. As the photograph (Fig. 1) shows, the fingers of the right hand are short and the webs, especially between the middle and ring fingers, extend farther towards the ends of the fingers than normal. The fingers have the normal number of joints. On the left hand the thumb lacks the terminal phalanx and also the nail. The index and middle fingers are united by a web as far as the base of the nail on the index finger. The webs between the middle and ring, and ring and little fingers are greater than normal. The terminal phalanges of the index and little fingers have slight motion, all the remaining joints are immovable.

The X-ray plate of the right hand (Fig. 2) shows remarkable shortening of the middle phalanges of all the fingers, the proximal and distal phalanges being normal. The plate of the left hand (Fig. 3) shows but one phalanx in the thumb and an absence of the usual sesamoid bone. The middle phalanx of the index finger is apparently fused with the distal phalanx which is abnormally long and irregular at its base. In the other three fingers the middle phalanx is not represented. In the middle and ring fingers the proximal and distal phalanges are fused together by true bony ankylosis, the trabeculae of bone passing from one bone to the other.

The man has worked as a carpenter and says the disability has been but slight. He has also a cleft of the soft and hard palates and a depression of the upper, left alveolar arch, the latter due to the kick of a horse.

CASE II.—*Loss of the Proximal Phalanx of the Index Finger.*—The patient was a man, aged 70, who presented himself

for varicose ulcers of the leg. Many years ago, "when Garfield was President," he cut his right hand on a circular saw, the index finger being nearly severed. His physician wished to amputate the finger but he would not allow it and simply wrapped the finger in a piece of cloth. Later the bone protruded from the wound and he returned to the physician and requested him to remove the protruding part. This the physician did with a pair of bone cutters. The wound eventually healed. Further details of treatment and healing are not remembered.

The index finger of the right hand is shortened to the level of the second interphalangeal joint of the middle finger (Fig. 4). Flexion and extension of the index finger are nearly normal but the range of motion in the terminal joint is somewhat limited. The grip between the thumb and forefinger is as great as that between thumb and an equal length of forefinger of the left hand. The remaining three fingers and the thumb show Heberden's nodes. They are most marked on the thumb and little finger.

The X-ray plate (Fig. 5) shows the absence of the proximal phalanx of the index finger except a small portion of the base. Clinically this fragment is ankylosed to the metacarpal bone, the motion taking place in the false joint between the fragment and the middle phalanx. This ankylosis is fibrous. (Compare with the true bony ankylosis represented in the plates of Case I, Fig. 3.) The terminal phalanges of other fingers and especially of the thumb show the bony changes of *arthritis deformans*.

The remarkable feature of this case is the adaptation of the muscles to the shortened finger. The finger has been shortened about one and a half inches, yet the flexor and extensor muscles have compensated for the slack, and without interfering with the portions controlling the other fingers. The perfection of the false joint is also noteworthy. That the tendons escaped injury seems improbable yet they were not sutured and seem to have made a perfect recovery.

FIG. 1.



Photograph of Case 1.

FIG. 2.



X-ray of Case I, right hand

FIG. 3.



X ray of Case I, left hand.

FIG. 4.



Photograph of Case 2, showing loss of proximal phalanx of index finger

FIG. 5.



X-ray of Case II, showing absence of first phalanx of index finger.

FRACTURE OF THE OS MAGNUM.

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THE older writers believed, and the statement is still maintained in many standard text books on surgery, that fractures of the carpal bones are very uncommon, and when they do occur are usually compound, comminuted or multiple.¹ That this statement is not in conformity with facts, as brought out by X-ray examination, is demonstrated by the increasing number of published case reports of isolated fractures of carpal bones, more particularly the scaphoid and semilunar. Among twenty cases of fracture of carpal bones which came under treatment in the Cologne City Hospital service of Prof. Bardenheuer, from 1901-6, only one concerned the os magnum.² The relative rarity of fracture of the largest carpal bone adds more than common interest to the following observation, which is reported with the object of calling attention to this hitherto neglected variety of fracture, and of stimulating surgical scrutiny in relation to so-called sprains of the wrist joint.

CASE.—Male, single, age 33. On August 16, 1908, while cranking an automobile, his hand slipped and the heads of the second and third metacarpal bones of the right hand struck with considerable force the spring, causing forcible flexion at the wrist joint. He was seen for the first time in the Surgical Department of Vanderbilt Clinic, No. 44,454, on August 18, 1908. He complained of severe pain and swelling of the wrist. The examination was made by Dr. Alfred C. Prentice. It was found that the right wrist joint was swollen and hot. Tenderness was diffuse over the carpus and motion was markedly limited. Acute pain was produced by manipulation. An X-ray examination revealed a transverse fracture of the neck of the os magnum. Wet dressings and an anterior splint were applied for three days, when the splint was discarded and the wrist joint strapped. On September

1, 1908, the adhesive was removed and the patient discharged, as he wished to resume his work as a chauffeur.

He was seen for the last time on October 7, 1908. He complained then of an inability to use the hand in efforts requiring strength. For example, he could not "crank" an automobile. Flexion and extension were limited, particularly the latter movement and marked tenderness was obtained by direct pressure over the bone. Distinct bone crepitus was elicited by manipulation of the hand, the palpating fingers being placed over the dorsal and palmar surfaces of the bone.

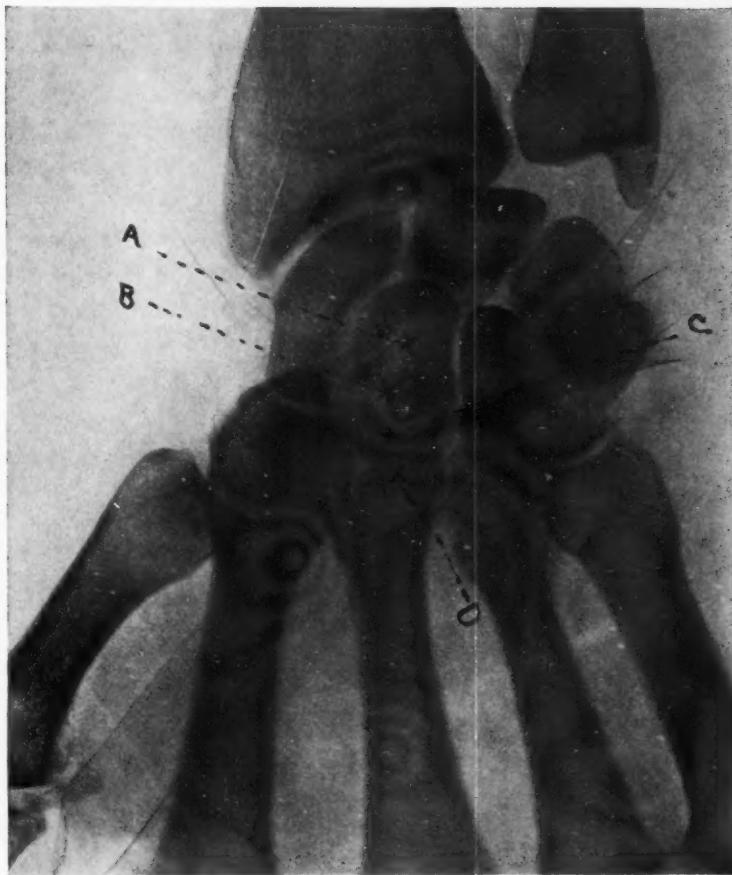
This outcome must not be regarded as especially unfortunate, since this small fracture, upon the basis of the anatomical relations, has been classed as one of the most serious and difficult to treat among fractures of the radiocarpal region. Moty³ holds that in traumatism of this character, more or less well-marked ankylosis of the two great articulations of the wrist joint must be considered as the natural termination.

A careful and thorough search of the literature reveals but five authentic reported cases, in four of which the diagnosis was based on the clinical signs and symptoms, and in one case only (that of Guermonprez-Monjaret⁴) was radiographic examination employed.

Before discussing these five authentic cases of fracture of the os magnum, reference should be made to several cases described in the literature in which the diagnosis was doubtful, or in which the fracture was associated with multiple fractures of other carpal bones.

The case of Robert,⁵ which is not accessible in the original, is quoted as doubtful by Le Dentu and Delbet.⁶ Duplay and Reclus⁷ refer to the case of a physician who sustained an injury to the wrist which was treated as a sprain. As a limitation of motion at the wrist joint persisted, the patient endeavored to determine the accuracy of the diagnosis by means of the X-ray; the radiograph showed a fracture of the scaphoid, trapezium, trapezoid and os magnum, and that these bones had become welded into one mass by exuberant callus.

FIG. 1.



Radiography. *A*. Upper fragment. *B*. Line of fracture. *C*. Lower fragment. *D*. Obliteration of normal joint line.

In a case reported by Guibout, quoted by Auvray,⁸ the os magnum was fractured at the same time as the scaphoid, pyramidal, and pisiform bone. Natrig⁹ reports a case in which the radiograph showed two fractures of the scaphoid, with detachment of the left lower corner of the os magnum.

Destot,¹⁰ in a paper reporting a large number of cases of fracture of the scaphoid, mid-carpal luxations, and fracture of the cuneiform, mentions three cases of fracture of the os magnum, without giving clinical histories and diagnostic criteria. Brigel at the 78th Meeting of German Naturforscher und Aerzte, 1906, mentioned two cases of fracture of the os magnum which came under observation in St. Katherine's Hospital, Stuttgart. Stimson¹¹ describes a case "in which the possibility of fracture was suggested by pain on pressure over the neck of the bone."

The authentic cases arranged in chronological order are as follows:

GUERMONPRÉ.¹²—This case, a fracture of the neck of the os magnum, was associated with an extensive synovitis of the flexor tendons, which the author believed was caused by the fragments piercing the synovial sheaths. Immobilization of the wrist was followed by recovery, but a slight increase in the anteroposterior diameter of the wrist joint remained.

BALTUS.¹³—This observer, whose case may be included on the authority of Delbecq, reported a fracture of the os magnum, in which the injury occurred in connection with a sudden violent twisting of the wrist joint.

BARDENHEUER.¹⁴—The patient was a laborer, sixty years of age, who fell from a scaffold, striking the ulnar side of the dorsum of the hand, and the heads of the third and fourth metacarpal bones. The diagnosis was based upon the exquisite tenderness and subsequent dorsal displacement of the head of the bone.

MORY (*l. c.*).—The patient, a cavalry soldier, was thrown from his horse, striking the dorsal surface of the left hand. When examined soon after the accident, a hard bony protubérance, round and smooth, was found, evidently formed by the radiocarpal articular surface of the carpal bone. This dislocation was easily reduced, and the forearm and wrist were immobilized. When examined on the second day, a large swelling was noted on the back of the hand and severe pain elicited over the lateral ligaments of the wrist joint. Crepitus was not obtained, and the styloid processes maintained their normal relationship. This dorsal swelling persisted and at the end of two weeks was still painful and tender; at that time distinct crepitus could be obtained by direct pressure.

GUERMONPREZ-MONJARET (*l. c.*).—The patient was a workman whose right hand was caught under a heavy millstone. The most evident symptom was great flattening of the hand and wrist which was followed in two days by a large swelling. The soft parts were intact and no crepitus could be obtained. The hand was immobilized for a few days, followed by massage, and exercises were recommended. Six months after the accident, there was swelling of the wrist, obliteration of the normal anatomical configuration, and muscular atrophy of the forearm and hand. A radiograph taken at that time showed a longitudinal fracture of the os magnum.

In studying the mechanism of this fracture, it is apparent that the injury may be caused either by direct violence over the bone, or indirectly by violence applied to the head of the second, third or fourth metacarpal bone, sufficiently severe to produce forcible flexion at the wrist joint. It is interesting in this connection to note that Auvray (*loc. cit.*) succeeded in producing experimental fractures of the carpal bones through direct or indirect violence, the latter being usually accompanied by lesions of the lower extremity of the radius.

In order to explain the manner by which forcible flexion at the wrist joint produces a fracture of the neck of the os magnum, it is necessary to describe the function of the mid-carpal joint as determined by the anatomical peculiarities of that joint. According to Gray,¹⁵ "the chief movements permitted in the transverse or mid-carpal joint are flexion and extension and a slight amount of rotation. In flexion and extension, which are the movements most freely enjoyed, the trapezium and the trapezoid on the radial side and the unciform on the ulnar side glide forward and backward on the scaphoid and cuneiform respectively, while the head of the os magnum and the superior surface of the unciform rotate in the cup-shaped cavity of the scaphoid and semilunar. Flexion at this joint is freer than extension."

Bearing in mind the "rotating" function of the head of the os magnum, it is readily understood that a force acting on the heads of the second, third or fourth metacarpal bones and producing forcible flexion at the wrist joint, is transmitted primarily to the second row of carpal bones and secondarily

to the first row. Therefore, if the posterior radiocarpal ligament be weak, a posterior dislocation of the wrist joint results. However, if this ligament be relatively strong and resistant, the strain during the transmission of force falls upon the weakest part of the relatively immobile os magnum—the neck—and a fracture ensues. That this reasoning is true, is proved by the anatomy of the mid-carpal joint and by the clinical study of the case of Bardenheuer and the one reported by the writer.

Symptoms.—The symptoms of fracture of the os magnum may be summarized as follows: An individual who receives a direct injury to the bone, or who strikes the heads of the second, third or fourth metacarpal bones violently enough to produce forcible flexion at the wrist joint, will complain of severe pain over the carpus and inability to use the hand. The pain is diffuse and may radiate to the fingers, following the course of the median nerve; it may be exacerbated locally by deep pressure. Crepitus at a distinct point of the region is of course pathognomonic, but may be marked by extensive swelling of the wrist. This swelling, which is the result of extravasation, promptly makes its appearance (see author's case) and is chiefly confined to the dorsum. The maximum point of tenderness is over the os magnum, and from an analysis of the reported cases, this appears to be the most characteristic symptom. If there be an associated dislocation of the head of the bone, a hard protuberance can be detected on the dorsum of the hand. A radiographic examination will serve to confirm the diagnosis.

The *treatment* of simple fractures, uncomplicated by synovitis consists in absolute immobilization of the hand, wrist and forearm, followed by massage. Complicated fractures require antiphlogistic treatment and immobilization until subsidence of the inflammatory symptoms. Articular stiffening and loss of functional power should be treated by active and passive motion, electricity, massage, and hydrotherapy.

CONCLUSIONS.

1. Fracture of the neck of the os magnum may be caused by direct or indirect violence.
2. The most characteristic symptom is a localized point of exquisite tenderness over the neck of the bone.
3. All severe sprains of the wrist joint should be subjected to X-ray examination.

In conclusion, the author wishes to thank Dr. Adrian V. Lambert, Chief of the Surgical Department, Vanderbilt Clinic, and Dr. Alfred C. Prentice, for the privilege of reporting this case.

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TRANSACTIONS
OF THE
NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 14, 1908.

The President, DR. JOSEPH A. BLAKE, in the Chair.

CHOLANGEITIS DUE TO COLON BACILLUS INFECTION.

DR. JOHN A. HARTWELL presented a woman, 39 years old, who was admitted to Bellevue Hospital on September 10, 1908. She gave a marked alcoholic history, and on admission was found to be suffering from acute alcoholism, as a result of which she had a severe gastritis. It was learned that for a month previous she had been vomiting more or less frequently and had suffered from pain in the epigastrium after eating, which was somewhat relieved by the vomiting. Her condition had grown progressively worse, and on one or two occasions she had vomited blood and had passed blood per rectum. All these symptoms were at first referred to her alcoholic history. An examination, however, revealed a large, tender mass beneath the right costal margin, and apparently closely connected with the liver, which itself was much enlarged. She complained of intense pain, rather diffuse, over the right hypochondrium and extending through into the back. Her fever was of the septic type; she looked sick, and had a leucocytosis of 23,600, with 82 per cent. polynuclears. The urine was normal. She was not jaundiced.

The case was regarded as one of cholecystitis, and the patient was operated on September 14, 1908, under gas and ether anaesthesia. The abdomen then became less rigid, and the mass referred to above was found to be the liver itself. An incision was made through the upper half of the right rectus muscle, and upon opening the peritoneum the liver was found to extend almost to the umbilicus, being apparently uniformly enlarged in all direc-

tions. It was soft, dusky in color, but no area of actually broken-down tissue could be found. It was not jaundiced. An exploration of the gall-bladder and ducts showed them to be patent, and no calculi were found. The gall-bladder, however, seemed somewhat thickened and inflamed. The stomach, pylorus and duodenum were found to be normal, and there was an absence of adhesions around any of them. Owing to the intense pain in the back, and the absence of positive findings connected with the biliary system, the lesser peritoneal cavity was explored through the gastrohepatic omentum. The peritoneal sac was found free from adhesions, but the pancreas was enlarged to one and one-half its normal size, and rather soft, with its blood-vessels distended to a marked degree. The condition of the organ suggested the possibility of an abscess in its head, and accordingly an incision was made into this, parallel with the ducts. A free hemorrhage resulted, but no pus nor broken down tissue was found. The case was therefore deemed one of infectious cholangitis.

The gall-bladder was stitched to the parietal peritoneum and drained externally through a tube. Its contained bile was thick and turbid. A cigarette drain was inserted into the incision in the pancreas, and the abdominal wound was closed in the usual manner. The patient bore the operation well, and left the table in good condition. The post-operative course was satisfactory, the temperature, pulse and blood findings gradually returning to the normal. There was a free drainage of bile through the tube, the bile becoming clear during the first day. The abdominal pain had entirely disappeared by the third day, and the liver was progressively growing smaller. The tube was removed from the gall-bladder on October 1, up to which time the drainage of bile had been copious. On that day the liver percussed about two inches below the free margin of the ribs, and could be felt. At the present time the drainage of bile has entirely ceased, and the liver is barely palpable below the free margin of the ribs. The patient is entirely free from pain and distress of any sort, and her digestion is excellent. Cultures from the bile drained from the gall-bladder at the time of operation showed a pure growth of colon bacillus. Examinations of the urine at no time showed any evidence of pancreatic involvement, the Cammidge test being absent on September 17 (Dr. Hastings) and again a week later (Dr. Meakin).

GONOCOCCUS PERITONITIS.

DR. HARTWELL presented a woman, 27 years old, who was admitted to the Presbyterian Hospital on September 18, 1908, in the service of Dr. Woolsey. Her family and personal history was negative up to the time of the birth of her child, one year previously; since then she had suffered from a vaginal discharge. For the past three months she had not felt as strong as previously, but no special symptoms were noted. On September 15 she was suddenly seized with a severe, cramp-like pain in the lower abdomen, slightly more marked on the left side, with a tendency to radiate over the entire cavity. On that and the following day she had severe diarrhoea, followed by obstinate constipation. She had repeated slight chills and an apparent rise in temperature at various times. She had vomited but once, and that on the day of admission.

The general appearance of the patient was that of a person suffering from intra-abdominal inflammation. There was no evidence of any disease outside of the peritoneal cavity. The abdomen was symmetrically distended, the distention being more marked in the lower half, but without difference on the two sides. It was tympanitic and tender to pressure, but no particular point of tenderness could be made out. No mass could be felt in the region of the appendix. Vaginal examination showed fulness and tenderness in the fornices, but no masses were felt. Temperature, on admission, 101; pulse, 120; respirations, 22; leucocytosis, 22,800; polynuclear count 81 per cent.

A diagnosis of spreading peritonitis was made, without determination of the site of the infection. One hour after admission, under gas and ether anaesthesia, a two-inch incision was made over the outer border of the rectus muscle, and upon opening the peritoneal cavity there was an escape of cloudy serum, without odor, which did not seem to be walled off. The appendix was exposed, drawn into the wound, and removed in the usual manner: it was slightly inflamed externally, but showed an entire absence of any lesion which could be held responsible for the peritonitis. The incision was slightly enlarged downward, and an exploration of the pelvic organs showed them to be normal excepting for the inflammation due to the peritonitis. The maximum degree of peritonitis, however, seemed to centre in the lower part of the

abdomen. The intestines were drawn out from this part with a view of finding a cause for the peritonitis in a perforation or volvulus. Nothing of this nature was found, however, and it was apparent that the peritonitis was general in character. The wound was enlarged upward, and a systematic search made of the whole intestinal tract, stomach, bile passages and pancreas without finding any entrance of infection. The gut was uniformly distended and covered in many places with plaques of fibrin. The exploration had entailed an extensive handling of the gut, and it was thought that a fatal paresis would result unless the gut was emptied of its toxic contents. Accordingly, the procedure recently advised by Monks and others, of irrigating through and through the bowel was decided upon, though a modified technic was used. An irrigating tube was inserted into the bowel just below the duodenum, and the second one just above the cæcum. Large quantities of warm saline solution were washed through the whole of the small intestine, evacuating a very considerable quantity of intestinal contents, which from its appearance, must be considered as excessively toxic. This procedure, however, is by no means an easy one, as the intestines have a marked tendency to angulation, resulting in a stoppage of a continuous flow for a distance of more than two or three feet. This necessitates a milking of the irrigating fluid from one end to the other, and a very considerable handling of the intestine, which is known to be disastrous in peritoneal inflammation. Whether the damage thus entailed was more than counter-balanced by the elimination of the toxic material, may be a question. The favorable outcome in this case seems to have justified it. The stomach was also washed out. After a thorough flushing of the peritoneal cavity, the abdominal wound was sutured without drainage. An intravenous infusion of salt solution was deemed advisable at the end of the operation.

Postoperative Course.—The patient was placed in the Fowler position. Nothing was given by the mouth, and turpentine stupes were applied to the abdomen. The convalescence was slow, but uninterrupted toward recovery. Gonococci were found in the smears from the peritoneal fluid, with no other organism, and cultures on blood serum developed no growth. Gonococci were found in abundance in vaginal smears. On the third day after operation the patient received injections of gonococcus vaccine,

and the vaginal infection was treated locally. Whether the vaccine had any favorable effect on the course of the peritoneal infection is impossible to say. Had a microscopical examination of the peritoneal fluid been made immediately on opening the abdominal cavity, a diagnosis would have at once been established, and the exploration in search of the site of infection would have thus been avoided. Such an examination seems to be the proper course in similar cases.

PERFORATED GASTRIC ULCER.

DR. HARTWELL presented a man, 48 years old, who was admitted to Bellevue Hospital on September 2, 1908. A year ago he had an attack of abdominal pain, with nausea and vomiting, which was of short duration. Aside from this, his digestion had always been good. There was a history of syphilitic infection six years ago, for which he was under treatment for five months.

On the day of his admission, the patient had been eating a great many apples, and while on the street he was suddenly seized with intense pain in the abdomen. The pain gradually increased in severity and was accompanied by marked nausea, but no vomiting. According to his own statement, he was in a profuse cold sweat. He was brought to the hospital in an ambulance, and while on the trip vomited several times with some relief from the pain, but he felt so weak that he could scarcely move.

On admission to the hospital, the patient seemed to be in a state of collapse. He was suffering intense pain, and presented the typical facies of peritoneal infection. The abdomen was somewhat distended, tense and generally tender, although the maximum point of tenderness seemed to be in the epigastric region. Rigidity was about equal in the two recti muscles, and no masses could be felt. A diagnosis of peritonitis was made, with the probable site of infection in the upper right quadrant, though the appendix could not be excluded. The leucocyte count was 18,000, with 79 per cent. polynuclears. There was slight elevation of pulse and temperature.

The patient was operated on two hours after admission. An incision was made through the right rectus at the level of the umbilicus. Free pus (not foul) was found in the peritoneal cavity; this was particularly localized in the right fossa. The appendix was found to be slightly adherent and kinked, but not

actively inflamed or perforated. Appendectomy done. Pus was found under the liver. The gall passages were normal. The ileum was explored and no perforation found. The region of the pylorus was explored, showing evidences of a fresh peritonitis and pus. The stomach was dilated. The transverse mesocolon was opened and the lesser peritoneal cavity and posterior wall of the stomach were apparently normal. There was no induration in the pancreas, but an indurated area was found on the anterior superior surface of the stomach, one inch from the pylorus. The stomach and pylorus were angulated, due to adhesions. In the centre of the indurated area was a pin-hole perforation, which was closed by overlapping the stomach wall with silk sutures. The pylorus was apparently patent; gastro-enterostomy, therefore, was not done, owing to the patient's condition and the time already consumed in the operation. The ulcer and perforation above described were found only on a second examination of the pyloric region, they having been at first mistaken for the result of the peritonitis, and not the cause of it. The abdominal wound was closed in layers, and a drain was placed at the site of the ulcer.

The postoperative course was satisfactory and progressive toward recovery. The patient was fed by mouth on the third day, and within ten days was taking full hospital diet with absolutely no discomfort. He had now been up and about the wards for about two weeks, and showed no evidence whatever of any gastric lesion. Gastric analysis at the present time showed a marked hyperacidity.

Dr. Hartwell said this case was shown with the hope of bringing out a discussion on the subject of performing a gastro-enterostomy in cases of acute perforation of gastric ulcer, either primarily or secondarily.

DR. ELLSWORTH ELIOT, JR., said that this question of whether or not to do a primary or secondary gastro-enterostomy after operation for acute perforation of the stomach had been very fully discussed at one of the meetings of the Society last spring. At that time, the speaker said, he had prepared a paper on the subject of acute perforative ulcer of the stomach and duodenum, with particular reference to the advisability of doing a gastro-enterostomy, either simultaneously or later on. That paper was published in the October and November (1908) issues of the AMERICAN JOURNAL OF SURGERY. It contained the result of the

author's investigations, covering the reports of several hundreds of cases published in the literature during the past five years, and supplemented by additional reports furnished by members of the American Surgical Association and others. Altogether, during that period, about one hundred cases were found where a gastro-enterostomy had been done at the time of the primary operation, and in these cases the mortality was high—at least fifteen or twenty per cent., whereas in those cases where the perforation was closed without gastro-enterostomy, the mortality was considerably lower.

A study of the cases also showed that in a very considerable number of them, in fact, in the great majority in which simple closure of the perforation was done without gastro-enterostomy either at the time of the primary operation or subsequently, the patients remained well for periods varying from one to five years; in one instance for six years.

In view of these facts, Dr. Eliot said, it seemed proper to postpone gastro-enterostomy until the patient should develop obstructive symptoms or show some other reason for further operation. His own feeling was that the operation of gastro-enterostomy was indicated at the time of the primary operation in those cases where closure of the ulcer caused mechanical obstruction, but that it should not be undertaken for the purpose of obviating the possible future occurrence of stenosis, ulcer or hemorrhage, or other protracted symptom inscribed with that condition.

HYPERTROPHIC PYLORIC STENOSIS.

DR. LUCIUS W. HOTCHKISS presented a man, 32 years old, upon whom he had operated for pyloric obstruction at Roosevelt Hospital on July 28, 1908. The patient, who was admitted to the hospital on July 24, had been the subject of considerable study elsewhere, and was thought first to be a case of simple gastric dilatation, but as his condition failed to improve under treatment, he was brought to the hospital for operation by Dr. Howard C. Hanscom, who had made the diagnosis of pyloric obstruction. His illness dated back one year, when his appetite became capricious. Two months ago he began to vomit, this occurring generally after supper, sometimes within half an hour, sometimes after several hours. The vomiting was preceded by nausea, but no pain, and was followed by relief. The vomitus

consisted of undigested food, and did not taste sour nor bitter, and, according to the patient's statement, it never contained food which had been taken a considerable time before. He had been constipated for the past year, and had lost, he thought, about eighteen pounds in weight.

His previous history was unimportant, excepting for the fact that he had had syphilis about six years before, with a rash and mucous patches, and moderate alopecia. He was treated by mercury for two years, and had shown no outward manifestations of the disease since. Four years ago he had had a "nervous breakdown," and was in a sanitarium for seven months. He had been unable to work for a year and a half, and his responses as to his symptoms and condition were given slowly and with apparent effort, so that it was very difficult to obtain from him a complete and satisfactory history.

Physical examination revealed a small, rounded mass, of firm consistency, in the region of the pylorus; this was felt on deep pressure in the subcostal angle, just to the right of the median line. It was movable laterally and vertically, and seemed also to move with respiration. It was not tender and sometimes it was not demonstrable. The patient was thin and sallow, and appeared to be somewhat feeble. He showed no glandular enlargements; his heart and lungs were normal; no knee-jerks could be elicited.

An analysis of the gastric contents showed free hydrochloric acid, 10; total acidity, 73; combined, 33; lactic acid, absent; starch digestion poor.

The patient was put to bed, saline enemata were ordered, and a soft, selected diet allowed. Under this regimen his strength seemed to improve, and he was prepared for operation, which was done on July 28, four days after admission. Through the usual incision above the umbilicus the stomach was found to be moderately dilated and loosely surrounded by the lesser omentum. The pylorus and first part of the duodenum were freely movable. The pylorus was thickened by a fairly uniform infiltration of its coats, though this was perhaps slightly more marked posteriorly, where there was a small patch of connective tissue in the peritoneal covering. This thickening of the walls of the pylorus, which was due either to hypertrophy or infiltration of the muscular coat, constituted the tumor felt, and had led to the contraction of the

opening into the duodenum to about the size of a lead pencil. On section, there was no ulcer of the mucosa found, and the contracted pyloric opening was practically concentric with its outer circumference. The pathologist reported the condition as "inflammatory," and upon search no spirochætae pallida were found, nor were any evidences of endarteritis or phlebitis of the vessels in the affected region noted. There was moderate soft enlargement of the glands along the pyloric portion of the greater curvature, but section showed nothing of a malignant or specific nature.

The pylorus was excised in the usual manner, and the ends of the duodenum and stomach were closed by sutures. A posterior gastro-enterostomy without a loop was then done, after the method of Mayo, and the abdominal wound was closed.

The after-course of the case was without incident and the wound healed promptly. The patient was allowed water by the mouth on the day after the operation, but was otherwise nourished by small saline enemas containing half an ounce of dextrose. On the second day, albumin water was given by the mouth every two hours, and on the sixth day fluids without milk were given in four-ounce quantities every four hours. On August 6, nine days after the operation, soft boiled eggs and scraped beef sandwich were allowed, and a soft selected diet was given after that date. The patient rapidly regained his strength, and his digestion is now excellent. He was discharged from the hospital on August 15, and since then had gained 34 pounds in weight.

This case, Dr. Hotchkiss said, had seemed rather remarkable in its pathology, and had led to considerable discussion as to the possibility of its being a syphilitic stenosis on account of the patient's antecedent history, although the histological examination failed to furnish conclusive proofs.

RENAL CALCULUS.

ALEXANDER B. JOHNSON presented a man, 39 years old, who for the past fifteen years had suffered from attacks of pain in the right lumbar region, radiating downward into the right testis. These attacks were very severe, and lasted about ten minutes. During the past year they had increased in frequency, so that a number of attacks had occurred each day, and had become more severe. He had never noticed anything peculiar about his urine, and otherwise his health was fairly good. A year ago an X-ray

picture of good quality showed no shadow of a stone. His urine at that time had been reported free from any abnormal ingredient. A second X-ray picture was taken at that time, and was also negative. The patient thereupon decided to have no operation done unless his symptoms grew worse.

He re-entered the hospital on September 11, 1908, with the history that the attacks of pain had become more and more annoying, and that he had lost some flesh. His urine at that time contained a few blood-cells visible under the microscope. He was operated on September 17, 1908, by Dr. Johnson. An incision was made below and parallel to the free border of the ribs, extending from the outer border of the rectus in front to the outer border of the erector spinae behind. The kidney was exposed, freed from its fatty capsule, and drawn into the wound so that its pedicle could be firmly held by the fingers as the kidney rested in the palm of the left hand. Dr. Johnson was unable to feel the stone on palpation of the hilum and pelvis. There was nothing abnormal about the appearance of the kidney. A hat-pin introduced through the convex border of the kidney into the pelvis at once touched a stone, and an incision an inch and a half in length was made along the middle of the convex border of the kidney into the pelvis, and a forceps inserted through the cut withdrew a somewhat heart-shaped stone weighing 40 grains. It consisted chiefly of uric acid, as might be inferred from the fact that although the patient was a slender man, and the X-ray negatives were satisfactory, the stone cast no perceptible shadow.

Dr. Johnson said he attached great importance to the complete delivery of the kidney, so that the pedicle could be compressed between the fingers while the kidney was incised, thus avoiding the troublesome hemorrhage which often occurred unless this was done. He said that the study of corrosion preparations of the blood-vessels of the kidney showed that while in the cortex of the organ, along the central portion of the middle of its convex border there were but few blood-vessels of any size, such was not the case at the bases of the pyramids, where vessels passed freely from side to side.

The kidney wound was sutured by two deeply placed mattress sutures of fine chromic gut, and a cigarette drain was inserted down to the wound of the kidney and brought out at the posterior angle of the external wound. The remainder of the wound in the abdominal wall was closed by sutures. Although the wound

remained entirely clean, and showed no evidences of urinary leakage, and although the patient continued to pass plenty of urine, which was normal in character except for a moderate amount of blood, some anxiety was caused by the fact that the patient ran a high temperature and was delirious for a week. The temperature did not reach normal until twelve days after the operation. Primary union occurred in the wound, excepting at the drainage opening. The patient left the hospital well twenty days after the operation, namely, on October 7, one week ago, and thus far had had no further discomfort.

RESULT OF OPERATION FOR UNDESCENDED TESTIS.

DR. JOHNSON presented a boy, twelve years old, whose right testis had never descended into the scrotum; otherwise he was a healthy child. There was a history of the occasional appearance of a tender mass in the inguinal canal. The operation was done about two months ago. An incision was made along the course of the inguinal canal. The external oblique aponeurosis was split as in Bassini's operation, and inspection showed the presence of a congenital hernial sac to which were adherent the structures of the cord, with the exception of the testis. The testis itself was but loosely connected with the epididymis, and lay within the abdominal cavity. The hernial sac was dissected away from the cord and sutured with a purse-string suture at the level of the internal ring. Bassini's operation was then done; the cord was pulled out of the inguinal canal with some force and sutured to the pillars of the external abdominal ring. The scrotum was then inverted and the testis sutured with catgut to its most dependent point. A very slight inflammatory reaction followed the operation, and the testis became slightly swollen, though not notably tender nor painful. Primary union occurred in the wound. At the present time, two months after the operation, the testis had increased in size; it lay well down in the scrotum, and there seemed to be no tendency toward a recurrence.

PERITONITIS IN CHILDREN WITH UNKNOWN SITE OF INFECTION.

DR. CHARLES N. DOWD read a paper with the above title, for which see page 821.

DR. HOTCHKISS said he had seen four or five cases of generalized peritonitis, all in adults, for which there was no assignable

cause. He could not speak of these cases in detail, as no cultures had been made. One of the cases recovered after a secondary opening, with irrigation of the abdominal cavity. The patient was a woman with a diffuse general peritonitis without visible cause, even after a very thorough exploration of the abdominal cavity. The cavity was irrigated, but the patient did very badly. Her condition was so desperate that as a forlorn hope the house surgeon removed the sutures two or three days later, introduced a tube, and again irrigated the abdominal cavity. Following this she made a good recovery.

DR. ELIOT said he had never seen cases in children like those described by Dr. Dowd. The cases he had had experience with were more like those referred to by Dr. Hotchkiss. The speaker said he had seen four or five cases of streptococcus peritonitis in adults, with recovery after an illness of four or five weeks, with continuous high temperature (104-5) and a corresponding pulse rate. Subsequently, the temperature fell by lysis. These patients were delirious most of the time. The stomach, as a rule, held out well. In one of the cases, a woman, where he was called upon to do an operation for ventral hernia two years after the peritonitis which originated in the pelvis, a careful exposure and exploration of the organs there situated revealed nothing abnormal.

Dr. Eliot said that in one case of general peritonitis in a young man of 25, the patient presented all the physical signs of a gastric perforation. Upon opening the abdomen, the small intestine was found enormously distended, but no definite cause for the peritonitis could be discovered. The patient recovered and returned in the course of six or eight weeks with a second attack of peritonitis from which he also after operation recovered. At the second operation, many adhesions were found, but no cause for the peritonitis could be discovered.

The speaker said that while we saw many cases of peritonitis in children, it was usually of the appendix type and of colon bacillus origin. The extensive blood counts made in connection with these cases were interesting, in that they indicated a severe grade of infection, and particularly for the reason that in this group of cases diarrhoea is the rule, whereas in other serious forms of spreading or general peritonitis diarrhoea is the exception. The presence of diarrhoea in peritonitis usually indicates a favorable

prognosis. It is surely of great importance to emphasize the fact that, in the peritonitis of children, diarrhoea should not in any way be favorably continued nor should it lead to delay in operation.

DR. JOHN F. ERDMANN said he had seen two of the cases in all probability reported by Dr. Kerley. One of the cases was an infant about eight months old, who was practically moribund at the time of operation. The abdominal cavity was filled with purulent material. Nothing was found in the region of the appendix or elsewhere to account for the infection. The case resulted fatally. In another case, a girl of eight or nine years old, with scarlet fever and otitis, there was a general streptococcus infection complicated with middle-ear trouble. This patient was also moribund, and Dr. Erdmann said he refused to operate. In a third case, seen in Hackensack with Dr. Edgar K. Conrad, the patient was a child two and a half years old who gave a history of diarrhoea similar to that in the cases reported by Dr. Dowd. There was distinct abdominal distention, and upon opening the abdomen, at least half a pint of pus was evacuated. The appendix was removed, although not dire and to the extent one would expect in such a purulent peritonitis. The child made a slow recovery.

DR. JOHN B. WALKER said he had seen two cases of peritonitis in children in which the infection was of unknown origin. One was in a child of five years; the other in a child of seven. One recovered and one died.

DR. JOSEPH A. BLAKE said he had operated on several cases of peritonitis in which he was unable to find the source of the infection. The patients died, and no bacterial examinations were made. He recalled several cases in children where the infection was traced to the Fallopian tube, and those in whom the tube was removed got well, while those in whom it was allowed to remain, died. In one or two of the cases, a little pus could be expressed from the tube. Possibly, some of these were of gonorrhœal origin.

In connection with this general subject, Dr. Blake said he had had the misfortune of operating on two cases, both adults, in which the peritonitis complicated an unrecognized pneumonia. In both there was free peritonitis, with marked injection of the peritoneum with serum and fibrin below the diaphragm, but no other discover-

able site of infection. Both cases recovered. The possibility of a peritonitis associated with an intrathoracic infection should not be lost sight of.

DR. DOWD, in closing, said that the blood examination in these cases showed a high leucocytosis and a high polynuclear count. The difficulty in diagnosis in children was partly due to the fact that abdominal inflammations were so often simply accompaniments of inflammations which were primary in other parts of the body. In the early stages of the inflammation there is less abdominal rigidity than frequently exists with a beginning pneumonia. The cases here recorded had been under the observation of very careful observers and early diagnosis had not been made.

BOOK REVIEWS.

THE PRINCIPLES AND PRACTICE OF MODERN SURGERY. By ROSWELL PARK, A.M., M.D., LL.D. (Yale. Lea Brothers & Co., 1907.)

THE author states that it has been his purpose in writing this book "to represent the surgery of to-day, obsolete, and obsolescent material having been excluded." A treatise on surgery written with such an object in view, presupposes selective ability and discrimination on the part of the author; for, while it is easy enough to decide on what is obsolete, it is not so easy to say whether an operation has merely become temporarily unfashionable or really out of date. There are fashions in surgery, as well as in millinery; and it is not always easy to foretell the permanent in surgery. There is certainly no one in the profession, however, better fitted to pass judgment on matters concerning the practice of surgery than Dr. Park. Long known as a brilliant and effective teacher, we naturally expect from him a work which will fulfil his purpose, and the expectation of the medical public.

This volume of one thousand pages is not too bulky to be easily handled. While it is a good deal more than an epitome, it is also far too thorough in its treatment of the various subjects to be called a hand book. To speak surgically, it contains no dead spaces, and the author is to be congratulated on the skill with which he has compressed so much that is of value into space relatively small.

No subject has been treated in a manner merely sketchy; and both student and practitioner will find each chapter a complete treatise, although condensed. Dr. Park's illustrations may be sometimes outlines, his text never. The writer well describes his method in the following brief but pithy sentence: "The surgeon and the physician have drifted too far apart. It is time they met again in the presence of the pathologist. Such a group, when properly constituted, forms an almost invincible triumvirate." These sentences may be commended to those rash individuals who

enter the practice of surgery as a specialty, with little or no experience and knowledge in surgical pathology and without some years of training first in general medicine. We ought to remember that the really great men in either medicine or surgery have, first of all, been pathologists. The path to real greatness in medicine and surgery passes through the dead house. For, unless a man has a thorough knowledge of morbid tissues and what may be called the mechanics and physics of disease, he can never become an accomplished diagnostician. Without such a foundation, natural aptitude and nerve may make a man an operator, but a man may be a good operator, and yet a very mediocre surgeon. Dr. Park might have gone further, and have said that a really good surgeon must himself be a sort of trinity—physician, pathologist, surgeon.

To particularize concerning this interesting volume, the five chapters of Part I are devoted to surgical pathology. The chapter on the surgical pathology of the blood contains all that is essential to a thorough understanding of the subject, both new and old. Part II treats of surgical diseases, including affections which are commonly called specific. There is an excellent chapter also on The Status Lymphaticus—a condition even now too little understood, and often overlooked entirely. Part III treats of surgical principles, methods and minor procedures and contains an interesting chapter on blood pressure, shock and collapse, anæsthesia and anæsthetics. Part IV treats of injury and repair and contains an excellent chapter on gunshot wounds; also a chapter on Asepsis and Antisepsis. Part V concerns surgical affections of the tissue and tissue system. There is a chapter on Cysts and Tumors, on Surgical Diseases of the Heart and Vascular System, Surgical Diseases of the Joints, Chapters on Fractures and Dislocations. Part VI treats of Special or Regional Surgery and contains a very complete record of the modern surgery of the abdomen, kidneys, bladder, and prostate; also all parts above the diaphragm. The half-tone plates (of which there are a large number) are singularly clear and free from blurring; in fact, they have all the distinctiveness of an original photograph. The sixty colored plates are of equal excellence. The publishers have done well by the author, and the book will, no doubt, receive the cordial commendation of the profession.

ALGERNON T. BRISTOW.

SURGERY. By JOHN ALLAN WYETH, M.D., LL.D. (University of Alabama). With 864 illustrations. Marion Sims Wyeth & Company, Publishers. New York City, 1908.

The first edition of this standard work appeared in 1887 and immediately took high rank among similar treatises. It was especially noteworthy, because of the author's valuable contribution to the surgery of the arteries. Indeed, nine years before this his prize essay on the arteries had been presented to the American Medical Association, and attracted much attention, both in this country and abroad. Dr. Wyeth was the first surgeon to point out the advantage of ligating the external instead of the common carotid, and his treatise on the subject has long been known as a classic. It was noteworthy for painstaking research, both in the pages of current literature and for much original work on the cadaver. The same care in regard to detail which won for the author his first laurels, he has bestowed on his treatise on surgery. Three editions were published by the Appletons—the last in 1900; but now we are presented with an entirely new work from the presses of a new publishing house. Marion Sims Wyeth & Co. come before the public with this their first book, a treatise on *Surgery*, by John Allan Wyeth. That the new house may publish many good books, and flourish exceedingly, will be the heartfelt wish of those of us who were fortunate enough to have known the grandfather, Marion Sims, that ornament of American Medicine, and the father, Dr. John A. Wyeth, ex-president of the American Medical Association, now President of the New York Academy of Medicine. Truly the young publisher has a great heritage in his ancestors. That he will publish many a worthy volume, we feel certain; but it will be a long time before he has a chance to better his first publication. Both father and son—author and publisher—are to be congratulated on the happy combination of circumstances which links them together in a new and pleasant relationship. The typography and illustrations of the new book are very creditable; the work is copiously illustrated, both with half-tone plates and plates in color. Nor have older methods of illustration been neglected. Whatever may be said of the beauty of the best half-tones which come from our modern presses, the camera can never entirely replace the burin of the engraver for teaching purposes.

Dr. Wyeth has succeeded in compressing into a volume of

less than 800 pages all the essentials of modern surgery and a great many of its refinements. Under the head of anæsthetics, Gwathmey's warm vapor apparatus receives mention; also Brown's mechanism for combined heated nitrous oxide and oxygen. Reference is also made to the enlarged scope of local infiltration anæsthesia as practiced by the author and Dr. Bodine at the New York Polyclinic. In the chapter on arteries, Matas endoaneurismorrhaphy is fully described. The author also refers to his own case of aneurism of the ascending aorta, in which he employed simultaneous ligation of the right carotid and subclavian arteries with success, the patient surviving for a year—dying after that interval of another disease. As an example of the possibilities of cocaine, the author states that he has tied the third division of the subclavian by the aid of this anæsthetic. The chapters on fractures and dislocations, while not exhaustive of course, are sufficient, and clearly illustrated. In the chapter on the surgery of the head, modern methods of attack on the cranial contents are fully described and well illustrated; and Cushing's operation for decompression receives particular mention. Under the head of trigeminal neuralgia, the recent procedure of Levy and Baudoin (in which alcohol injections into the affected nerves are used), are fully described. The chapter on abdominal surgery contains a concise description of all the modern methods, as elaborated by Moynihan, the Mayos and others. The half-tone plates in this chapter will be exceedingly useful to the operator who is new to these methods. The modern surgery of the prostate gland—particularly Young's operation—is carefully described. The chapter on the genito-urinary organs of the female contains an excellent description of plastic operations on the outlet, and an account of the methods of the late colleague of the author, Dr. Pryor, in attacking diseased appendages through the vaginal route, in which he was so successful. The chapters on neoplasms and the surgical infections, while relatively brief, as might be expected in a work limited to less than 1000 pages, nevertheless contain the main facts. Dr. Wyeth is to be congratulated upon his ability to compress so much in so small a space. He has written an admirable text-book for the student, a compendium for the general practitioner, and a volume which his colleagues and co-workers in surgery will often consult with profit.

ALGERNON THOMAS BRISTOW.

DIE OPERATIONEN BEI MITTELOHREITERUNGEN UND IHREN INTRAKRANIELLEN KOMPLIKATIONEN. Für Aerzte und Studierende von DR. B. HEINE. 8vo, pp. 197. S. Karger, Berlin, 1906.

This is altogether a very satisfactory work, which will well repay the aurist to read in the original. To some of its teachings brief reference will be made. Thus: in middle ear inflammation, paracentesis is indicated if bulging exists, accompanied by fever and severe pain. Inflation is contraindicated in acutely inflamed ears. Paracentesis is also indicated when mastoid tenderness or swelling of the soft parts already exists. This applies more forcibly when symptoms of meningeal irritation appear.

Chapter 3 is devoted to the discussion of "Removal of the Ossicles." He is sceptical as to the benefits of this operation, as when the ossicles only are affected, expectant treatment may bring about a cure, and if other structures are involved the radical operation must finally be done. Consequently he only recommends ossiculectomy when the ossicles are affected and the hearing is considerably reduced and expectant treatment has been without avail.

In Section II, Chapter 2 and 3, "Opening of the Mastoid Process and of the Antrum" is discussed. Local anesthesia can be employed, if general anæsthesia bids fair to prove dangerous. All loose bone attached to the dura must be removed with blunt hooks, as, if left, it may bring about gangrene of the dural wall. Diseased dura should be widely exposed up to its healthy limits. If it be necessary to remove the whole posterior osseous canal wall, he endorses Winkler's recommendation to form a flap of the posterior soft canal wall and tamponade it into the mastoid wound, so as to bring about a patent canal.

Every collection of granulations must be removed and followed to its termination in healthy bone. He uses the electric head-lamp for illumination. Iodoform gauze, loosely packed, is used.

A trial of Bier's treatment for acute mastoiditis in Heine's clinic on 15 cases, gave 9 cases coming to operation. If the local and general symptoms do not soon improve, then one must not delay operation (and, in the experience of the reviewer, even such

improvement under this plan of treatment may only serve to hide serious mastoid and intracranial involvement in recurrent cases of acute mastoiditis). As a rule, the radical operation is indicated in every case of cholesteatomatous middle ear suppuration. Heine believes in the trial of conservative measures first. He recommends for irrigation a weak formaline solution. The operation is indicated when no improvement appears, when the discharge continues foetid; when in chronic suppuration an acute mastoiditis develops or symptoms of intracranial involvement appear.

Heine states that the point of predilection for involvement of the labyrinth is the horizontal semicircular canal, especially on its convexity or its anterior angle. When we have vertigo, the best proof that it truly depends upon a disturbance of equilibrium is given when we can demonstrate nystagmus; and then the operation must not be delayed. The same warning obtains should facial paralysis appear.

In 22 out of 63 cases of uncomplicated diffuse purulent meningitis occurring in the Berlin University ear clinic, the cause of this fatal disease was a suppuration of the labyrinth. Operation on the labyrinth always entails a certain danger to the patient. We can not with certainty differentiate between a circumscribed and a diffuse labyrinthitis. The irritative symptoms are, for the cochlea, subjunctive tinnitus; for the vestibular apparatus, vertigo, disturbances of equilibrium, nystagmus, nausea and vomiting. The destructive symptoms are, for the cochlea, deafness; and for the vestibule and semicircular canals, disturbances of equilibrium without vertigo and nystagmus. Barany's test; if one syringes a normal or suppurating ear, whose vestibular apparatus is intact, with water below the body temperature, there occurs a rotary nystagmus toward the opposite side and the reverse, toward the syringed ear, occurs if the temperature of the water is above that of the body. If no nystagmus appears, then the vestibular apparatus of the diseased ear is destroyed.

Heine concludes: If a defect of the semicircular canal is found, at first leave it alone, but if labyrinthine symptoms then do not disappear or augment, or first appear after operation with augmentation of the general symptoms, indicating meningitis, then operate on the labyrinth.

In Phlebitis and Thrombosis of the Transverse Sinus and the Jugular Vein, Griesinger's symptom, tender circumscribed œdema on the posterior border of the mastoid process, is uncertain, as it may be caused by disease of the bone or frequently by extradural abscesses in the posterior cranial fossa; Gerhardt's symptom, unequal fullness of the external jugular, is also unreliable, and Heine joins with Körner in stating that he has never observed it. The diagnosis is practically impossible if there are no decided symptoms of a general pyæmic infection. Perisinous abscesses, as a rule, give no symptoms on which to base a diagnosis before operation. With high fever, especially in children, every other cause for the fever must be excluded. Exposure of the sinus is not to be considered as a harmless procedure. When in doubt, Heine punctures the sinus as an exploratory measure, and believes this to be much less dangerous than incision, principally because it is not necessary to pack after puncture. He removes the thrombus only so far as it is broken down, and depends upon Nature and frequent changing of dressings to take care of the infection; in exceptional cases, the thrombus is completely removed, especially in the streptococcal infections. Ligation of the jugular is reserved for certain cases only, in which it is clearly indicated.

The question of ligation of the jugular in sinus thrombosis is still debatable; in fact, it may favor an extension of the process to other sinuses, the inferior petrosal, the cavernous, etc.; there is the danger that the internal jugular vein of the sound side may be rudimentary, when cerebral œdema or necrosis may follow. (Linser found that in 3 per cent. one jugular foramen was only from three to four mm. in size.) Heine ligates when the thrombus is broken down and the sinus wall is discolored; in other cases, if the temperature remains high after operation or mounts after a preliminary fall, with rigors, then the bulb must be cleaned out and the jugular vein be widely opened.

For operative evacuation of Brain Abscesses, he recommends attack through the mastoid, also trial punctures with large canulæ rather than incisions. Heine would not fear to introduce the canula up to 7 cm. If an abscess is discovered, then the dura is incised in the direction of the length of the temporal convolutions. He uses a drainage tube wrapped around with iodoform gauze. One should always remember that brain abscesses are relatively rare, but general brain symptoms, that appear to indi-

cate abscess formations, can appear quite frequently in the course of middle ear suppurations.

In Meningitis Serosa, a certain diagnosis is not yet possible; lumbar puncture is to a certain degree helpful. Removal of the focus of disease in the middle ear and exposure of the diseased portion of the brain usually suffices.

In Meningitis Purulenta, the prognosis, as with the serous form, is no longer absolutely bad; the middle ear is to be operated upon as early as possible. Circumscribed purulent meningitis is curable. As a rule, to which there are no exceptions, we will not go wrong, if we find by lumbar puncture a purulent liquor containing bacteria, to conclude that we have to do with a lepto-meningitis purulenta. Heine holds diffuse purulent meningitis to be incurable. From a clinical point of view, it is not possible to differentiate the circumscribed from the diffuse form.

Operation consists in eliminating the infective focus in the bone and exposing the dura, so far as it appears to be unhealthy; in the serious form, we can incise the dura; and finally, we can use lumbar puncture to withdraw a portion of the purulent fluid.

Lumbar Puncture: In otitis with intracranial complications this is not certainly free from danger; *e.g.*, the withdrawal of the liquid may lead to the rupture of an abscess into the ventricle. If from the clinical picture we believe the diagnosis of purulent meningitis justifiable, then we do a lumbar puncture; if the liquid is distinctly purulent and contains bacteria, we do not operate, even if it contains bacteria, or is a purulent liquor without bacteria.

HENRY A. ALDERTON.

NIERENCHIRURGIE. Ein Handbuch für Praktiker von PROF. DR. C. GARRÉ, Geh. Med.-Rath. Direktor der Chirurg. Klinik der Universität Breslau; und DR. O. EHRHARDT, Privatdocent für Chirurgie an der Universität Konigsberg i. Pr. Mit 90 Abbildungen im Text. Berlin, 1907. Verlag von S. Karger, Karlstrasse 15.

Together with Küster's contribution on Renal Surgery in "Deutsche Chirurgie, and Israel's Monograph of Surgical Kidney Diseases, the "Nierenchirurgie" of Garré & Erhardt, under consideration constitutes a triad of the German conception of surgical affections of the kidney. Very different from its forerunners, we note in this latest book a very liberal acknowledg-

ment of the contributions of American authors to this specialty of surgery.

The subject matter is covered in nineteen chapters, excellently illustrated. It is an eminently practical treatise, strikingly void of theories and imbued with healthy, not ultra, conservatism. The opening chapters are devoted to anatomical and physiological considerations followed by remarks on the general principles of operative technique of the kidney and anomalous conditions of the organ. For the treatment of Floating Kidney, the teaching is commendably conservative. Operation is advised when repeated colics are judged to be due to bends and tension of the ureter, if there be a complicating tuberculosis, or hydronephrosis, and when orthopaedic measures fail. Hysteria is an absolute contraindication. Guided by these criteria, Garré says the operations are not likely to be listed in the hundreds. The mortality of subcutaneous rupture of the kidney is placed at 47 per cent., therefore the more surprising is the very conservative attitude that operation is to be reserved for severe injuries even though the greater danger of an ascending infection in acknowledged.

In Hydronephrosis, the authors limit nephrectomy to instances of obliterated ureter, where a fistula of the renal pelvis becomes persistent and when suppuration supervenes.

The definitions of Pyelo-Nephritis, Pyelitis, and Pyonephrosis are clearly and sharply drawn. It is shown that these conditions pass into each other and often exist side by side. Lavage with urethral catheter for any other than simple Pyelitis is disparagingly spoken of, for greater infection may supervene and, to be effective, the procedure must be repeated, but this induces nervous exhaustion.

In the chapter detailing the causes of Anuria and Oliguria, the authors prove to be believers in reflex anuria and reno-renal reflex. The latter though can only be established beyond doubt if cystoscopy has been practiced on the remaining kidney.

Essential hematuria is denied and the ability of Edebohls to judge the presence of nephritis by palpation is called to account. Neither is the palpation nor the inspection, nor the microscopic examination of a small piece of kidney sufficient to explain the hematuria. These obscure renal hematurias form the basis of the modern therapy of decapsulation. Nephrotomy is the operation of choice with a section of a thin slice of the parenchyma. Garré,

as the result of personal experience, sees little encouragement in decapsulation for nephritis. The exclusive descending (haemogenous) origin of the tuberculous is not conceded. Authors are advocates of early nephrectomy and while admitting the advantages accruing from climatic change and better hygiene, spontaneous cure is denied except that rarely the ureter becomes obliterated. Tuberculin is well spoken of early in the disease and for slight diseased conditions; statistic for renal tuberculosis do not take cognizance of the latest figures of Albarran, Casper and Brown. Ureteral catheterization of the diseased kidney alone is sanctioned, wherefore the use of the "Luy's Separateur" is warmly commended. Again in the diagnosis of nephrolithiasis not much importance is attached to cystoscopy, the X-ray is supreme, and the authors claim a positive finding for all stones if a compression diaphragm is used. Somewhat contradictory is the advice to adhere to Israel's indication to operate for stone only if vital indications prevail and if symptomatic phenomena persist and yet further on the operation is recommended for every stone demonstrable by X-rays. This change of face is based on the very low mortality associated with the operation.

Tumors of the kidney are treated of as those of the parenchyma, the pelvis and the capsule. The comparative frequency in the variety of tumors is not brought out. Common to all tumors is the involvement of the vessels which makes for metastases and dangerous ligation of the vessels with displacement of the thrombus.

In chapter XVII Cystic Tumors, Adenocystomas, Echinococcus Cysts, Aneurysms and Pararenal Cysts are discussed.

The concluding chapter deals with injuries and diseases of the ureter.

MARTIN W. WARE.

THE PRACTICE OF PÆDIATRICS, in Original Contributions by American and English Authors. Edited by WALTER LESTER CARR, A.M., M.D., of New York. Illustrated with 199 engravings and 32 full-page plates. Lea Brothers & Co., Philadelphia and New York, 1906.

The volume treating of the practice of Pediatrics, under the editorship of Dr. Carr, of New York, is one of a series of treatises published under the title "The Practitioner's Library." Although there are many books of recent issue treating of the

diseases of infancy and childhood, most of them are the product of the experience of one man, and while such books are in themselves very valuable, still the expression of opinion of a number of eminent pediatricians has a distinct place in the library of the medical practitioner. It is strange, however, to note that all of the American authors follow along the same rut not only in the manner of presenting the subject under discussion, but also in condemning the observation, and oftentimes the experience of other men whose methods of treatment are opposed to their own. The preface states that this volume of *Pediatrics* is from the pens of well-known authorities in America and England, who have been selected as eminently fitted to write on the subject assigned to them, and to this statement we can take no exception as a glance over the list of contributors justifies it.

In this country we are far behind other nations in provision for the nursing of children, and although the main facts and most of the accepted theories of the best methods of nursing the child are advanced in this volume, still they have not brought forward prominently enough the methods which have been so successfully employed in France and England. One authority tells us that for many years he has used sterilized milk extensively in rearing innumerable infants, without the development of a single case of infantile scurvy, another authority tells us that milk should never be sterilized, and that it is even dangerous to pasteurize milk on account of the dangers of malnutrition. Whom are we to believe? The present work is up to date from the American standpoint, and is a valuable addition to the subject of pediatrics.

PAUL PILCHER.

STUDIEN AUF DEM GEBIETE DES KRIEGSSANITATSWESENS IN RUSSISCH-JAPANISCHEM KRIEGE, 1904-1905. By DR. WALTER VON OETTINGEN, Surgeon in Berlin, Chief Surgeon of the Livland Field Hospital of the Red Cross in Eho and Mukden. (Manchuria.) Dedicated to Professor Ernst von Bergmann upon the celebration of his 70th Birthday. 7 x 10, pp. 247; 50 illustrations. August Hirschwald, publisher, Berlin, 1907.

In America so much was written during the Japanese-Russian War concerning the military operations upon land and sea of the Japanese, and so much attention was paid to the extra-

ordinary achievements in military hygiene, and in the actual care of the sick and wounded men in the camp and on the battlefield by the Japanese, that it is something of a relief, professionally, to find that in certain ways, at least, the Russian forces endeavored, so far as they could, to accomplish similar results within their own military sphere of action. It is therefore with especial interest that one reads this book by Dr. Walter von Oettingen, a surgeon of Berlin who accompanied the field hospital of the Red Cross in the campaigns at Eho and at Mukden, in Manchuria. The unusual experiences which the author underwent during this campaign, he has grouped together in the present volume, and dedicated them to his former chief, Professor Ernst von Bergmann as a part of the "Festschrift" published upon the occasion of the seventieth birthday of that distinguished surgeon.

When the climatic difficulties which attended this series of active campaigns are considered, the results obtained must be considered remarkable. The effort was made, so far as possible to avail himself of the practical teaching and experience acquired by von Bergmann in the Turkish War, and to secure, so far as circumstances would permit, the greatest possible relief for the sick and wounded in the field.

The material in the volume may be divided into two general sub-divisions, the first dealing with the preparations and activities in the Red Cross hospitals from November, 1904, until the 26th of February, 1905, and the second a description of the medical experience which took place during the famous twelve days' battle at Mukden, lasting from the 25th of February until the 9th of March, 1905.

Under the first subdivision, military surgeons will find much of value in the detailed descriptions of the means of transportation and of the construction of field hospitals in a country where the ground was frozen to a depth of many feet during a large portion of the year, and where the mere necessity for obtaining sufficient warmth to prevent the wounded from being frozen to death even after they had entered the hospital wards, was one of the most difficult problems that the military surgeon had to solve. The surgical equipment and the details of administration are also of much interest, and are made of value by the numerous illustrations in the text.

A special experience was gained in the use of the portable Döckers barracks. When the war was declared, it was decided to take five of these portable structures with the Red Cross, into the field, although it was maintained by many that the use of these structures in a climate like that of Manchuria, was ill advised.

As a matter of fact, however, the results obtained were very satisfactory, and this was especially true when the site of the hospital was not too great a distance from the railway. With a practiced Hospital Corps, it was found possible to erect this field hospital in from seven to eight hours, and under favorable conditions, even greater speed in preparation was achieved. The result was that in many instances, two well equipped operating rooms were made available in a short time, and in connection with these, a dispensary for the administration of medicines and the distribution of field medical supplies.

Another detail of construction of interest to military surgeons, was the use of earth huts of kind commonly used in Siberia by the peasants. These were amplified for military purposes into much larger structures, some of them 24 metres wide and 60 metres long. The greatest height at the apex of the roof in these large hospital wards so constructed, was 18 feet, and at the side the eaves reached practically to the level of the ground. Trenches four feet deep are dug longitudinally through the floor of this structure and upon the layers of earth left between the trenches in strips 15 feet wide, the blankets of the wounded were laid and improvised beds were constructed. In this manner the surgeons were able to reach the patients in the ward in the easiest way and to have them at a suitable height for proper care. Ventilation was secured by openings at regular intervals in the roof which was covered thickly with earth to maintain warmth, and at each end through double doorways and windows giving access to the wards and permitting them to be light.

Many interesting and accurate details are given of the different structures and dressings that were improvised in similar ways, growing out of the necessities of the country and the climate.

In the section devoted to the "Twelve Days' Fight," the transportation of the wounded the first day upon the battlefield

itself, the class of injuries, particularly those caused by modern small caliber high power projectiles from the infantry rifle, and the other class caused by shrapnel so freely used by the Japanese in their field artillery, receive especial attention.

As a whole, the book is a most interesting and profitable one. It supplies to the professional reader many new ideas as to the manner of guarding against infection and of securing good results under the most unfavorable conditions, and to the lay reader it presents in a vivid manner the difficulties and dangers that attend the prosecution of an actual campaign where both man and nature have combined to render mere existence almost an impossibility. To both it brings vividly to mind the celebrated axiom attributed to Gen. Sherman, that "War is Hell!"

HENRY P. DE FORREST.

THE DIAGNOSIS AND TREATMENT OF DISEASES OF WOMEN. By HARRY S. CROSSEN, M.D., Clinical Professor of Gynecology, Washington University, St. Louis, Mo., etc. 799 pages and 700 illustrations. C. W. Mosby Medical Book and Publishing Co., St. Louis, Mo., 1907.

The author sets forth the aims of the book in its preface. It "is devoted exclusively to the diagnosis and treatment of diseases of women as those diseases are met with in the office and at the bedside by the general practitioner. No space is given to other considerations (etiology, pathology, major operative technique), except as necessary to bring the work to its highest usefulness as a practical guide in the lines indicated. While no space is taken up with detailed technical descriptions of major operations, much care is taken to set forth clearly the differential diagnosis of the various conditions requiring such operative treatment, the kind of operation called for by the particular conditions present, what the operation is intended to accomplish, the preparation of the patient for operation and the after care necessary to complete the restoration to health."

Over 220 of the 700 illustrations are original and many of these are reproductions of photographs which represent the various steps in the diagnosis and treatment of pelvic disorders. The remaining illustrations have been chosen from various sources and due acknowledgment and credit is given these sources both in the preface and text.

As has been stated, the work is devoted exclusively to the

diagnosis and treatment of diseases of women from the standpoint of the general practitioner. The writer has born this in mind throughout the entire book and has very carefully described and illustrated (especially by photographs) each procedure which he has deemed necessary for the practitioner to understand. The systematic arrangement of the subject matter and the very careful attention to detail (though at times apparently too explicit), both in the text and in the illustrations, should prove of value to the general practitioner who has not had sufficient training in gynecological diagnosis, especially if he lives far from a medical centre and has to rely on his own resources.

JOHN A. SAMPSON.

THE OPERATIONS OF SURGERY. By W. H. A. JACOBSON, M.Ch. Oxon., F.R.C.S., Consulting Surgeon Guy's Hospital; and R. P. ROWLANDS, M.S., F.R.C.S., Assistant Surgeon Guy's Hospital, Joint Teacher of Operative Surgery in the Medical School. Fifth edition. 777 illustrations. Vol. I, 8vo., pp. 926. Vol. II, 8vo., pp. 1139. London: J. & A. Churchill. Philadelphia: P. Blakiston's Sons & Co. 1907.

The advances in operative surgery which have taken place since 1902, when the fourth edition of Jacobson's appeared, have been so extensive that a most thorough and comprehensive revision had become a necessity if the author wished to have his work continue as a reference book for students and practitioners. This is accomplished in the present edition by the aid of Mr. R. P. Rowlands, who has taken Mr. Steward's place and has written the sections dealing with the general surgery of the abdomen, and Mr. D. B. Smith, who has made himself responsible for the re-written and thoroughly revised chapters on "Operations on the Ovary and Uterus." We regret to note the author's determination to make this the last edition in which he will take an active part.

Volume I deals with the operations on the upper extremity, head, neck and thorax. The author has wisely omitted the insertion of meaningless illustrations of procedures and instruments, preferring to quote cases which illustrate the point needing explanation; the book is remarkable for the number and completeness of such interpolations.

Owing to the frequency with which infusion is performed, attention should be drawn to the poor technique the author has

given in his description of this minor operation; I am sure a young man, following the method here described, would have trouble in introducing the cannula and also run a great risk of sweeping into the circulation a blood-clot which may have formed in it. How much simpler and cleaner it is to insert the cannula while the solution is flowing from its open end, obviating absolutely any chance of clot or air embolus. The author makes no mention whatever of the introduction of opsonins, which would naturally come after his article on antiseptic injections. This subject has beyond doubt already proved that it is worthy of a surgeon's most serious consideration.

The operations on the brain, their indications and technique are well considered. The author, however, does not mention the latest and successful operations on tumors of the base of the brain, and also those for the removal of tumors or cysts of the pituitary body; these have been successfully performed, have absolute indications, require certain technique, and will hereafter have to be considered. In the chapter pertaining to operations on the oesophagus; we remark an exceptional omission, *i.e.*, the oesophagoscope; a similar criticism is to be made concerning the bronchoscope. How much easier for the operator and safer for the patient it is to have foreign bodies removed *per viam naturalem*, than by thoracotomy or tracheotomy.

Volume II, containing, in the greater part, the work of Rowlands and Smith, treats exhaustively the surgery of the abdomen, lower extremity and vertebral column. The author devotes four pages to the description and problematical use of the Luy's segregator or separator; an instrument whose inefficiency has so often been demonstrated and the results for operative interference gained by its use are so questionable, that in place of lauding its virtues, the same space might be better applied to describing its restrictions. On the other hand, the cystoscope has been very inadequately considered; ureteral catheterization is merely mentioned, on page 254, and then only to be condemned by quotations from Morris; the modus operandi of its accomplishment is not even indicated. Lavage or antiseptic injection of the pelvis of the kidney in pyelitis *per se*, or collection of urine by use of the cystoscope and ureteral catheters is entirely omitted.

The author, in the sections devoted to the operations on the stomach, has shown excellent judgment in his selection of cuts and descriptive methods, no small task in these days when our

surgical literature is so surfeited with new and startling innovations. The condemnation of the use of the Murphy button is a noticeable feature; we feel, however, that the field of its usefulness is probably greater than the author ascribes to it. Post-operative ileus and acute gastric dilatation should have received more attention than the mere mention of the condition. Whitehead's operation for hemorrhoids is described to be, in the majority of cases, too radical and too often followed by unfortunate sequelæ, a judgment in which, I think, most surgeons must concur. On the subject of spinal anesthesia, the author mentions the fact of its limited use and frequent inefficiency; to this the writer takes exception, and notes the omission of the cardinal rules which should be observed to effect its being obtained, that is, the site of injection and the rapidity and degree of inversion of the patient.

The most notable features of the book, aside from its completeness, are the fully considered and well presented judgments and operative innovations that are ascribed to American surgeons, a condition no book which has previously come under our notice has contained and which ought to insure for it a most favorable reception in this country. The authors are to be congratulated on the fullness and conciseness of their descriptions and on their many and judicial discussions.

JAMES TAFT PILCHER.

A TEXT-BOOK OF PRACTICAL GYNÆCOLOGY FOR PRACTITIONERS AND STUDENTS. By D. TOD GILLIAM, M.D., Emeritus Professor of Gynæcology in Sterling-Ohio Medical College, etc. Second Revised Edition. F. A. Davis Company, Publishers, Philadelphia, Pa., 1907.

In the present volume the writer has presented what he believes the student and busy practitioner should know about the diseases of women. The scope and size of the work, of necessity, limits the fuller treatment of the various subjects in gynecology. As in other works of its class its chief value lies in the presentation of methods of diagnosis and treatment which, from practical experience, the author has proven to have been of value to him.

In the style of the book, *i.e.*, a "plain connected narrative" the writer has presented us with one of the most readable and concise works on any medical subject.

JOHN A. SAMPSON.

A MANUAL OF ORTHOPÆDIC SURGERY; by AUGUSTUS THORNDIKE, M.D., Assistant in Orthopedics at the Harvard Medical School; Visiting Surgeon to the House of the Good Samaritan; Assistant Orthopedic Surgeon to the Children's Hospital, Boston. P. Blakiston's Sons & Co., Phila. 1907.

This short concise handbook meets a real want for a book on Orthopedic Surgery which is comprehensive and yet omits needless detail. It is probably the best book on the subject to give to the student in the medical schools for collateral reading in connection with the lectures on Orthopedic Surgery. For the practitioner who wishes a quick and accurate reference, it has merit; and the orthopedic surgeon will find the divisions very clearly presented and the whole subject brought up to date.

It would appear that the first chapter, on the malformations of the limbs, laid perhaps too much stress upon the unusual deformities of intra-uterine formation—deformities which are oftener seen in medical museums than in actual practice. The concise treatment of the subject of the orthopedic care of infantile paralysis and the practical chapter on the use of plaster-of-paris should be especially noted. The pictures are well chosen and the form of the volume is convenient for carrying.

WALTER TRUSLOW.

METABOLISM AND PRACTICAL MEDICINE. By CARL VON NOORDEN, Professor of the First University Clinic, Vienna. Anglo-American Issue under the Editorship of I. Walker Hall, Professor of Pathology, University College, Bristol. Vol. I. The Physiology of Metabolism, by Adolf Magnus-Levy, Berlin. Vol. II. The Pathology of Metabolism, by Carl von Noorden, Fr. Kraus, Ad. Schmidt, W. Weintraud, M. Matthes and H. Strauss. Chicago: 1907, W. T. Keener and Co.

Though based upon von Noorden's smaller work on metabolism this Anglo-American Issue represents the combined labor of a score of authors, many of whom are well-known workers in the fields with which their respective articles deal.

These two volumes contain an encyclopedic account of the physiology and pathology of metabolism; a vast amount of data being presented in readily utilizable form, unsettled questions

critically discussed and warrantable conclusions clearly stated. Though brevity of statement is the rule there is no dearth of detail; but in places the impression forces itself upon one that the author of a given chapter had not thoroughly digested the material at hand before attempting to write an account of it.

As a whole, the work is well done, and its authors deserve a high degree of commendation; and those of us who admit the truth of the conception that many, if not all diseases are, essentially disturbances of metabolism, will find this treatise to be a veritable storehouse of information.

J. C. CARDWELL.

BIER'S HYPERÆMIC TREATMENT. By WILLY MEYER, M.D., Professor of Surgery, New York Post-Graduate School and Hospital, and Professor Dr. VICTOR SCHMIEDEN, Assistant to Professor Bier, University of Berlin, Germany. Octavo of 209 pages. Illustrated. W. B. Saunders Company, Philadelphia and London. 1908.

We have for some years past been anticipating the appearance of some book descriptive of the method which Dr. Bier so extensively employs. This has at last been given us by the authors in the present volume. The various and interesting theories which have been promulgated as to the real working of this procedure are omitted, as are also any mention of illustrative cases. In Dr. Bier's personal writings these both find expression, and tend rather to lend interest as well as scientific introspection than to detract from it.

The book is well and instructively illustrated with the more or less familiar suction apparatuses, hot air boxes and elastic appliances. In the ingenuity of the devices for cupping the various parts of the body, and in the larger vacuum chambers, we recognize the exceptional and fertile originality and mechanical aptitude of Dr. Klapp.

The working theory of these various appliances is easily summed up. Accepting the fact that hyperemia is the physiological process by which inflammation or infection is to be combated, we deduce that in so far as it may be possible to increase this process just so much greater will be the benefit derived by the invaded tissue. Thus while previously inflammations were

considered detrimental so that the physician's first duty was to fight them, now we go to the other extreme and attempt to artificially increase the redness, swelling and heat, three of the four cardinal symptoms of acute inflammation.

This book deals with the practical application of this theory and is divided into a General and a Special Part. The former taking into consideration the advantages of the hyperemic treatment over other methods, the methods of inducing hyperemia, and the general rules for the application of hyperemia, that is, elastic bandage, suction apparatus and hot air. In the Special Part the treatment of diseases and conditions of the entire field of medicine and surgery are taken up, including surgery, medicine, gynecology and obstetrics, genito-urinary surgery, otology, ophthalmology, rhinology, pharyngology and laryngology, neurology including psychiatry, and finally dermatology.

The text is clearly printed, terse and lucid; in the wide margins at the side is appended on each page, in heavy type, the subject which is described on that page, thus facilitating ease of reference. The English nomenclature for this process is certainly puzzling; nothing we have seems to express clearly and correctly just what we want; it is very probable and not inappropriate that the German terminology of "Stauung's Hyperæmie" should be taken over bodily.

The most fully treated affections and those from which we are able to draw the best conclusions because of the greatest experience with them, are probably the tubercular affections, principally of the joints, mastitis and the acute infections, especially gonorrhœal arthritis. There are many things to which objections may be taken, probably the mention of the most obvious will suffice. The advice of applying a neck band for invasion of the mastoid is to be condemned, the dangers accruing from such a procedure are so much greater than any problematical benefit; the easy inception of a lateral sinus thrombosis, brain abscess, septicemia, etc., which can not be appreciated because of a complete masking of the symptoms. In fact, this particular application for any reason, except in the young, is fraught with the risk of the most serious consequences, for who is there that can say what are the conditions of the cerebral arteries; even though superficial ones may appear perfectly normal? The facts should receive consideration, even by an enthusiast, that the clinics of

Europe, even in Bonn itself, have completely discarded and absolutely condemned this method.

Generally, judgment of the highest order and wide observation are required. Continual observation of this procedure, at least where major and dangerous conditions are present, should be insisted upon, and this can not be obtained nor given by the ordinary practitioner; it can only find its advocates among those of large hospital experience. Its expensiveness makes it impracticable for other than institutional application, except, of course, in minor conditions.

Thus one comes to appreciate that the drawbacks in some degree counterbalance the proffered advantages, and it will be some years yet before we can strike the mean between the extremes which are at present existing between Berlin and the rest of the medical world.

JAMES TAFT PILCHER.

OPHTHALMIC SURGERY. By DR. JOSEF MELLER, of Vienna, P. Blakiston's Sons and Company.

While nothing less than continued actual experience can give to one the skill necessary to successfully practice surgery, and particularly ophthalmic surgery, there is published once in a great while a book that seems almost to be a connecting link between the theory and practice, and this may be stated of the one under review; for we rarely see a work in which the illustrations are as true to real conditions, or the descriptions as lucid as is the case here.

The operation for excision of the lachrymal sac, which is being more frequently performed of late than formerly, is graphically portrayed; and as much may be said concerning the operations for removal of the lachrymal gland and for passing the nasal probe.

The various operations upon the eyelids for entropion, ectropion and canthoplasty, are made very clear, as are also those upon the eye muscles, including "advancement." The plastic operations done upon the lids are well described.

Much space and detail have been given to the operations for the extraction of senile cataract and iridectomy in glaucoma.

Concerning the chapter dealing with the cataract operation, while the reviewer is in accord with most of the valuable sugges-

tions, issue is taken with the advice to the surgeon to stand or sit at the patient's side while operating, as it is believed that the knife is under much better control when being drawn toward the operator, than when being pushed from him. The reviewer regards the cystotome in the hands of the majority of operators as a much safer instrument with which to rupture the lens capsule than the capsule forceps, which in the hands of all but the most expert may easily cause dislocation of the lens by pressure. At the present time there seems to be a tendency to the practice of performing a preliminary iridectomy in cataract extraction.

The various steps in the operation of iridectomy for glaucoma are very satisfactorily explained. The reasons for using either one of the two kinds of knives, Graefe cataract knife, or lance, are set forth. The reviewer believes that there is less danger of injury to the lens and to the base of the iris with the use of the Graefe knife; and agrees with the author in believing that the wound made with this knife, because of its slight tardiness in healing, is one more favorable to the end we wish to attain. The author commits himself to neither choice. In acute inflammatory glaucoma a general anæsthetic is to be advised, because of the probability of the pain making the patient intractable.

In general it may be stated, that this volume should receive a most sincere welcome, as it must prove of great value to all, and more especially to those who have not the opportunity of attaining wide practical experience, for it is they who are liable to neglect details that are clearly set forth in this book, and the omission of which often does so much to defeat the purpose desired. There is no hesitancy in recommending this work to the attention of every ophthalmologist, even for those who are more mature in this practice it will prove a classic in ophthalmic literature, and a distinct addition to any library.

JAMES COLE HANCOCK.

ADENOMYOMA OF THE UTERUS. By THOMAS S. CULLEN, M.B., Associate Professor of Gynæcology, in Johns Hopkins University. Large octavo of 270 pages and with 68 illustrations by August Horn, Hermann Becker and Max Broedel. Philadelphia and London: W. B. Saunders Company, 1908.

This work is based on the careful study of over ninety cases of this condition. The material was obtained chiefly from the

Gynaecological Department of the Johns Hopkins Hospital and from Dr. Kelly's private sanitarium. The writer found this condition in 5.7 per cent. of 1283 specimens of myoma examined from April 1, 1893, until July 1, 1906.

The early literature of the subject is first discussed and this is followed by a report of several cases, which constitutes the bulk of the book.

In the report of the cases, the clinical history is first given, then a description of the operation, gross appearance of the specimen removed and the result of the microscopical examination of pieces of tissue removed from the specimen. After the report of the cases the writer discusses, in separate chapters, the clinical picture of this condition, differential diagnosis, treatment, prognosis, origin and cause.

He divides adenomyomata into the following groups:

1. Adenomyomata in which the uterus preserves a relatively normal contour.
2. Subperitoneal or intraligamentary adenomyomata.
3. Submucous adenomyomata.

He believes that all adenomyomata of the uterus in which the glandular elements are similar to those of the uterine mucosa, and are surrounded by stroma characteristic of that surrounding the normal uterine glands, owe their glandular origin to the uterine mucosa, or to Müller's duct, no matter whether they be interstitial, subperitoneal or intraligamentary, whether solid or cystic.

Lengthened menstrual periods are the first symptoms. The flow gradually assumes the proportions of hemorrhages and eventually the period may become continuous. The menstrual period is usually associated with dysmenorrhœa. The writer believes that diffuse adenomyoma is the only pathological condition of the uterus which, as a rule, gives the following clinical picture:

1. The bleeding is usually confined to the period.
2. There is usually much pain, referred to the uterus, at the period.
3. There is usually no intermenstrual discharge of any kind.
4. The uterine mucosa is perfectly normal and may be rather thick.

The only way to control the bleeding is to remove the uterus and the prognosis for a cure is excellent.

The book-making is of the best, and many of the sixty-eight illustrations are among the finest in medical literature. To the gynaecologist, pathologist, and all others interested in adenomyomata, this monograph with report of cases should prove interesting.

JOHN A. SAMPSON.

ANÆSTHETICS: THEIR USES AND ADMINISTRATION. By DUDLEY WILMOT BUXTON, M.D., B.S., Member of the Royal College of Physicians. Fourth Edition. London, Philadelphia. P. Blakiston's Son & Co. 1907.

The book deals with all the methods of producing anæsthesia including in this new edition the use of ethyl chloride as a general anæsthetic and the production of anæsthesia by spinal injection.

The author first advises the beginner how to approach the study of anæsthesia. The historical data is given in an interesting chapter. Then follows a chapter on the preparation of the patient and the choice of anæsthetic. The relation of anæsthesia to disease, the special requirements in operations about the head, neck, face, trachea, and respiratory tract, the methods of administration in Abdominal Surgery and in Labor are all thoroughly discussed.

The chapters on general anæsthesia are good, but the chapter on Local Analgesia is not sufficiently up to date. Local analgesia is being used more frequently than in former years and this subject deserves fuller consideration.

Many of the American and German inventions have not been mentioned, but if these had been included they might confuse rather than enlighten the student.

The book has been carefully written and is accurate in its teachings.

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A Monthly Review of Surgical Science and Practice.

Edited by LEWIS STEPHEN PILCHER, M.D., LL.D., of New York.

WITH THE COLLABORATION OF

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OF PHILADELPHIA.

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